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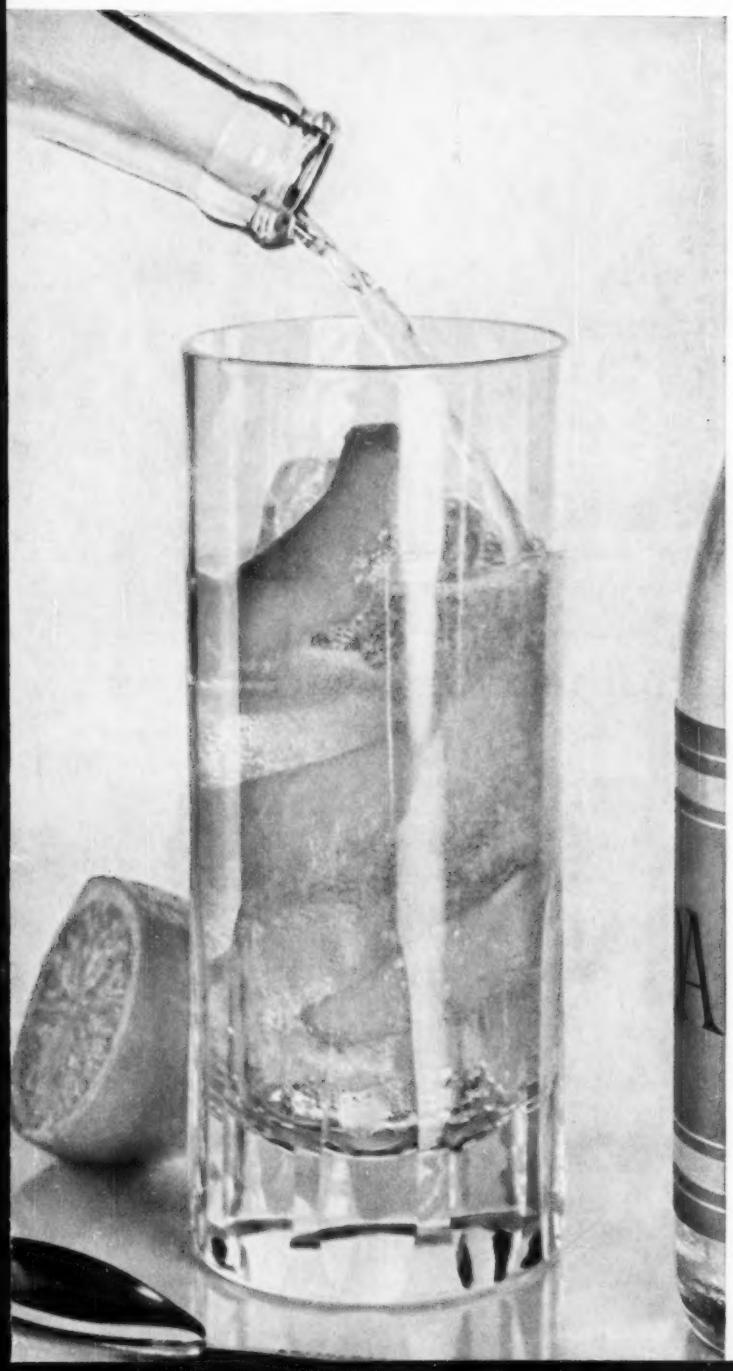
Chemical Week



MARCH 26, 1960 Price 50 cents

A federal fuels policy—what it can mean to the CPI . . . . . p

CW Special Report on acetylene: a five-year outlook . . . . . p. 45

Long look at shipping: Government report pegs ills, suggests cure . p. 91

New HF expansions spurred by fluorocarbon gains . . . . . p. 101

Treat for specialties makers . p. 117

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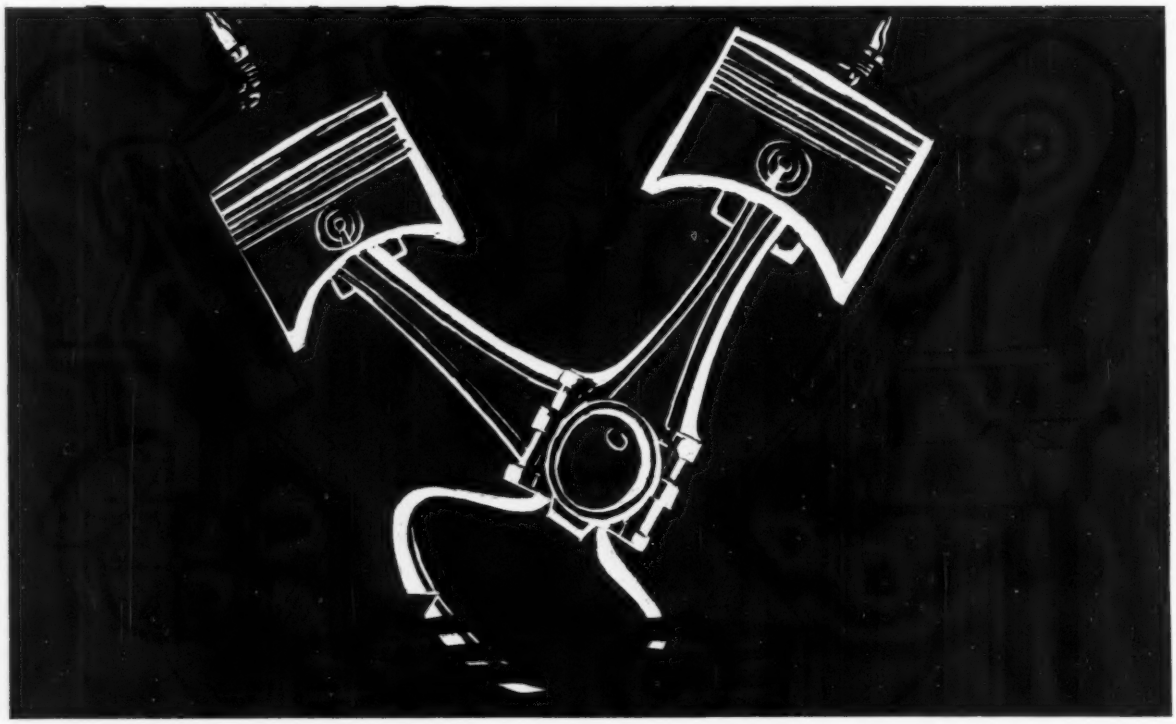

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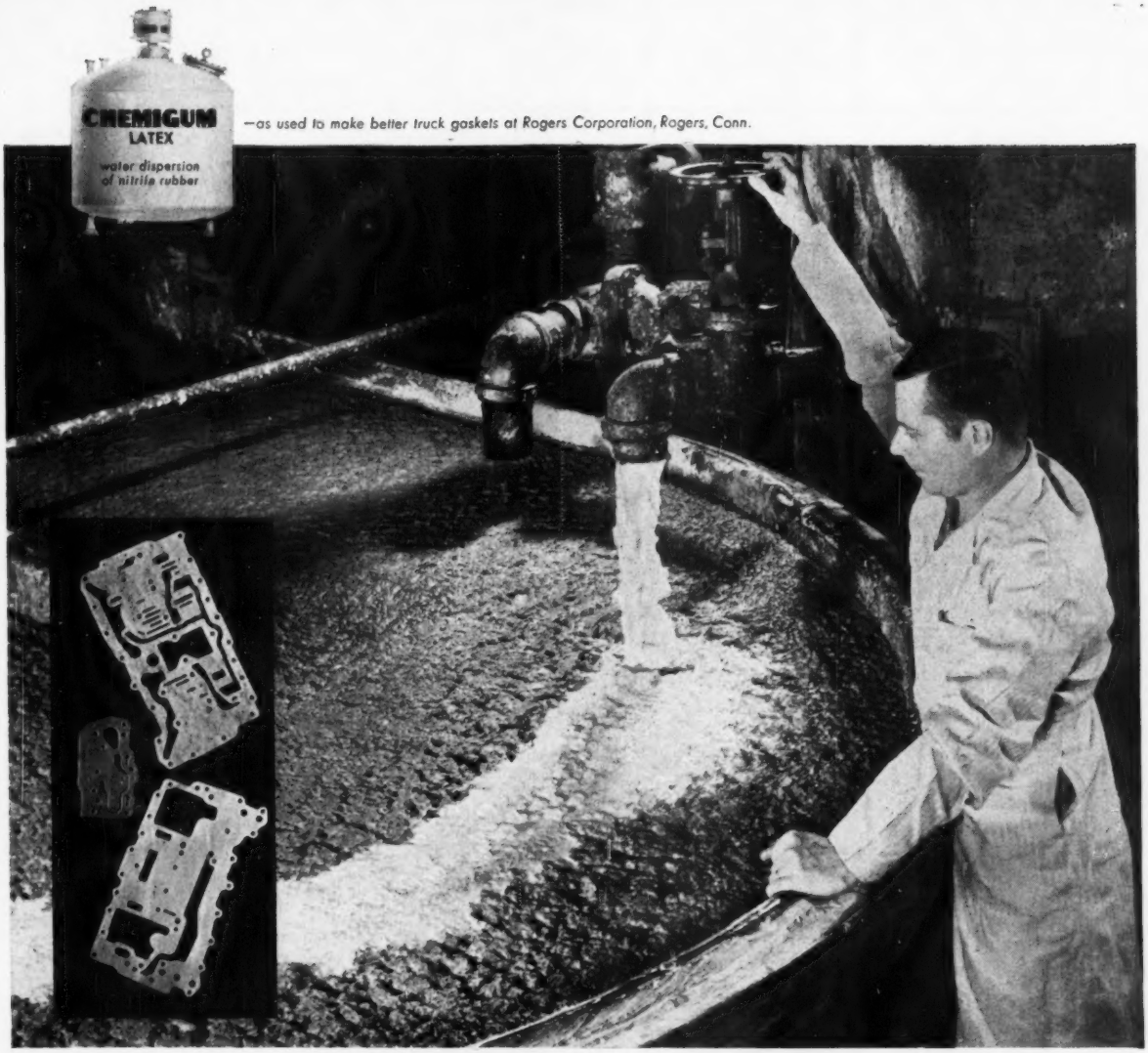

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TOP OF THE WEEK

MARCH 26, 1960

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37 Now that polypropylene monofilament has proved successful, makers eye multifilament, staple.

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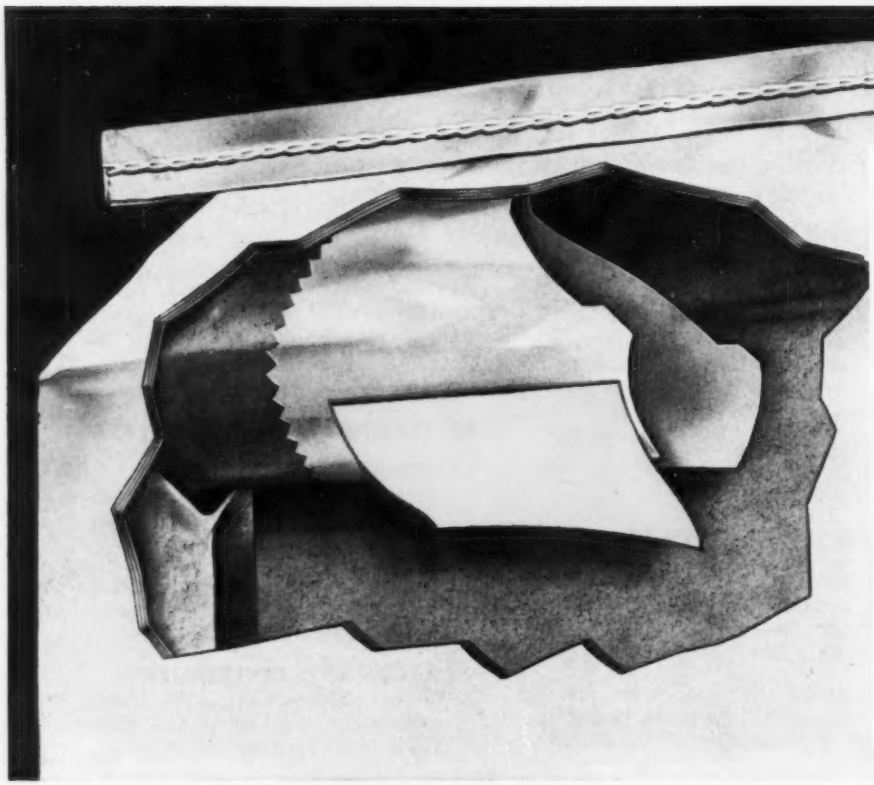

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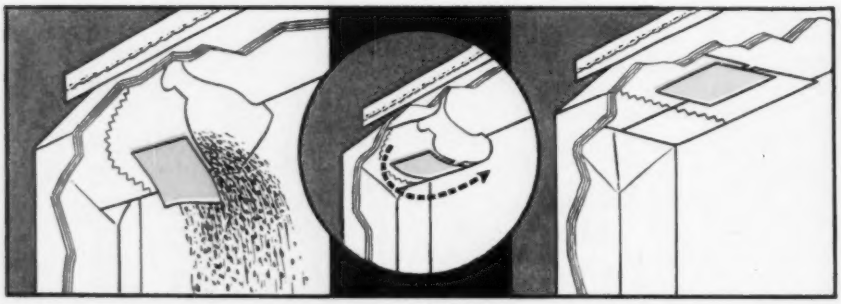

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LETTERS

Fluoridation: Con

TO THE EDITOR: The Jan. 30 Business Newsletter comments on the introduction of fluoridation into Wilmington, Del. It is difficult to see how this is any more significant a piece of news than the fact that fluoridation has just been discontinued in Concord, N.H., North Reading, Mass., and Melbourne, Australia.

You will be interested in the attached book review that appeared in today's *Boston Herald*, concerning a book by Philip Sutton of the Melbourne University Dental School. The *Boston Herald* has won four Pulitzer prizes, and Alden Hoag, who wrote the review, is chief of the editorial staff.

The book analyzes the statistics in back of the fluoridation thesis, and comes up with the conclusion that its efficacy has not been proved.

You will undoubtedly want to call the attention of your readers to this book. . . .

NORMAN MEYER
Advertising Manager
Barnstead Still & Sterilizer Co.
Boston

The book is "Fluoridation, Errors and Omissions in Experimental Trials," by Philip R. N. Sutton, Melbourne University Press; New York: Cambridge University Press (paper, $1.75, 83 pp.).—ED.

MEETINGS

Western Petroleum Refiners Assn., 48th annual meeting, Hilton Hotel, San Antonio, Tex., March 28-30.

Nuclear Congress, Coliseum, New York, April 3-8.

American Chemical Society, national meeting, Cleveland, April 5-14.

Lead Industries Assn., 32nd annual meeting, Chase-Park Plaza Hotel, St. Louis, Mo., April 6-7.

Chemical Institute of Canada, Rubber Chemistry Division, annual meeting, Kitchener, Ont., April 8.

Synthetic Organic Chemical Manufacturers Assn., meeting, Roosevelt Hotel, New York, April 12.

Second European Symposium on Chemical Reaction Engineering, Koninklijk Instituut voor de Tropen, Amsterdam, Holland, April 28-30.

Parenteral Drug Assn., Warwick Hotel, Philadelphia, April 29.

VIEWPOINT

USDA Seeks Alcoholic Solace

NOBODY KNOWS WHAT TO DO about the agricultural surplus problem. Now, at least, somebody has come up with an idea: hand the problem over to the chemical industry. No doubt the chemical industry could handle it better than anyone else who has tried his hand at it, but we doubt whether it is our responsibility.

What evoked these petulant thoughts is a mimeographed form recently circulated by the U.S. Dept. of Agriculture among a number of chemical companies. It asks "offerors" to take a try at turning the government's warehouses full of surplus corn into industrial alcohol. Just at the moment, USDA wants this done on a fairly small scale (the manufacturer must have storage facilities for a 10-day supply of corn, be prepared to operate the process for six months). USDA wants to turn the surplus stocks into "products that constitute other than primary uses for corn." And it wants detailed figures on how it's done.

As it happens, the necessary information is available. There are figures that show quite clearly why industrial alcohol is not a primary use of corn. Why? Corn-derived alcohol is too costly.

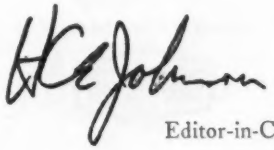
At present, about 7.5 million gal. of ethyl alcohol are made from corn in this country each year—about 1.5% of the total supply. Virtually all of this shows up in alcoholic beverages, where corn, as a starting material, yields variously preferred drinks. But before corn can become competitive with petroleum as a source of industrial alcohol, the price, according to one knowledgeable manufacturer, would have to be in the neighborhood of 50-60¢/bushel.

USDA has recognized this, is prepared to accept bids for the corn rather than to insist—under its usual policy—upon selling only at a fixed price of 105% of the support level. This is now $1.06/bu.

A company participating in the program, therefore, would have to tender a bid for the corn at somewhat less than half the price the government paid for it in the first place. Moreover, since the process would have to be set up, involving capital expenditure and a good bit of risk (who knows how long the government will be willing to take this kind of loss?), it would have to be considerably less than half-price to be attractive.

So far the chemical industry isn't buying. We think it is wise. Throughout its history the industry has been built on sound economic principles, paying a fair and reasonable price for its raw materials, using efficient processes, and charging fair and reasonable prices for its end-products. It is, for this reason, a healthy industry. This is no time for it to get involved in the government's questionable theories of agricultural economics, nor is it any time to become dependent upon governmental whim (look at the current state of the aircraft industry).

Clearly the whole scheme is based upon election-year politics. Each member of each party seems to have his own private theory on how to cope with the surplus problem, the general aim being to appear—until November at least—to be all things to all men. In the heat of a campaign, the industrial alcohol program no doubt looks like the heaven-sent answer to a politician's prayer. We suggest, however, that it's a pitfall, not a panacea.



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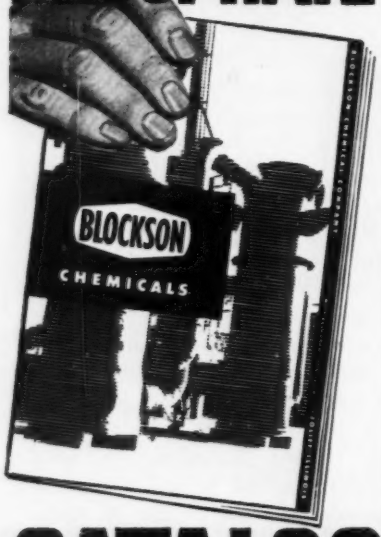

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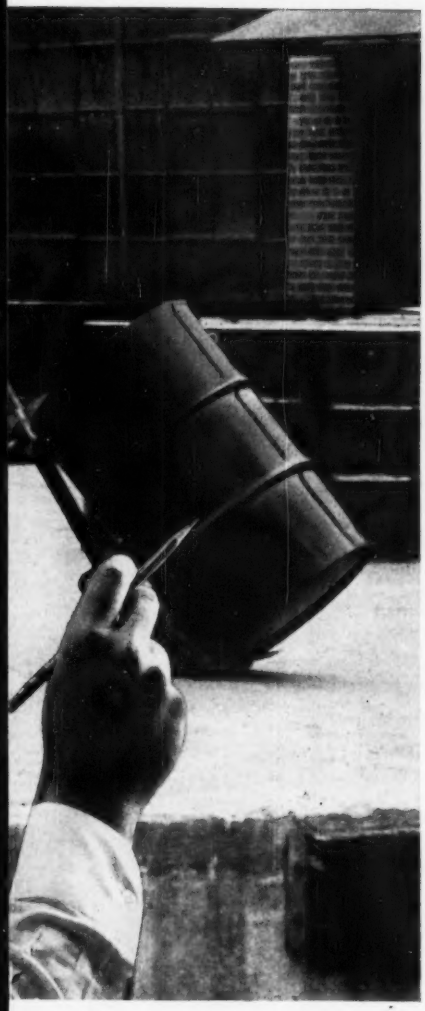

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Providence — Borden & Remington Co.
Providence — George Mann & Co., Inc.

SOUTH CAROLINA
Columbia — F. H. Ross & Co.
Greenville — F. H. Ross & Co.

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TENNESSEE
Chattanooga — Burkart-Schier Chemical Co.
Knoxville — Burkart-Schier Chemical Co.
Knoxville — F. H. Ross & Co.
Nashville — Burkart-Schier Chemical Co.

TEXAS
Dallas — Van Waters & Rogers, Inc.
Houston — Van Waters & Rogers, Inc.

UTAH
Salt Lake City — Braun-Knecht-Heimann Co.

WASHINGTON
Seattle — Van Waters & Rogers, Inc.

WISCONSIN
Milwaukee — McKesson & Robbins, Inc.**

For Hytrol® O:
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CALIFORNIA
Los Angeles — Braun Chemical Co.
Los Angeles — McKesson & Robbins, Inc.†
San Francisco — Braun-Knecht-Heimann Co.

COLORADO
Denver — Braun-Knecht-Heimann Co.

ILLINOIS
Chicago — Central Solvents & Chemicals Co.

INDIANA
Fort Wayne — Hoosier Solvents & Chemicals Corp.
Indianapolis — Hoosier Solvents & Chemicals Corp.

KENTUCKY
Louisville — Dixie Solvents & Chemicals Co.

LOUISIANA
New Orleans — Southern Solvents & Chemicals Corp.

MARYLAND
Baltimore — Leidy Chemicals Corp.

MASSACHUSETTS
Boston — Howe & French, Inc.
Worcester — Chemical Sales & Service Co., Inc.

MICHIGAN
Detroit — Western Solvents & Chemicals Co.

MINNESOTA
Minneapolis — McKesson & Robbins, Inc.**

MISSOURI
Kansas City — Missouri Solvents & Chemicals Co.
St. Louis — Missouri Solvents & Chemicals Co.

NEW JERSEY
Newark — Chemical Solvents, Inc.

NEW YORK
Buffalo — Buffalo Solvents & Chemicals Corp.

OHIO
Cincinnati — Amsco Solvents & Chemicals Co.
Cleveland — Ohio Solvents & Chemicals Co.
Toledo — Toledo Solvents & Chemicals Co.

TEXAS
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MASSACHUSETTS
Boston — Howe & French, Inc.
Worcester — Chemical Sales & Service Co., Inc.

MICHIGAN
Detroit — Western Solvents & Chemicals Co.

MISSOURI
Kansas City — Missouri Solvents & Chemicals Co.
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NEW JERSEY
Newark — Chemical Solvents, Inc.

NEW YORK
Buffalo — Buffalo Solvents & Chemicals Corp.

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Cleveland — Ohio Solvents & Chemicals Co.
Toledo — Toledo Solvents & Chemicals Co.

TEXAS
Dallas — Texas Solvents & Chemicals Co.
Houston — Texas Solvents & Chemicals Co.

WISCONSIN
Milwaukee — Wisconsin Solvents & Chemicals Corp.

MINNESOTA
Duluth — McKesson & Robbins, Inc.**
Minneapolis — McKesson & Robbins, Inc.**

MISSOURI
Kansas City — McKesson & Robbins, Inc.*
St. Louis — McKesson & Robbins, Inc.*
St. Louis — Missouri Solvents & Chemicals Co.

NEW JERSEY
Newark — National Oil & Suppiy Co.
Paterson — Brown Chemical Co., Inc.

NEW YORK
Buffalo — Chemical Sales Corp.
Hicksville, L.I. — National Oil & Supply Co.
New York — McKesson & Robbins, Inc.**

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KENTUCKY
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MASSACHUSETTS
Boston — Howe & French, Inc.
Worcester — Chemical Sales & Service Co., Inc.

MICHIGAN
Detroit — Western Solvents & Chemicals Co.

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Kansas City — Missouri Solvents & Chemicals Co.
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NEW JERSEY
Newark — Chemical Solvents, Inc.

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TYPICAL ANALYSIS FOR CRYSTAL UREA:

pH (10% solution at 20°C.)	8.3
Moisture	0.25%
Ash	9 ppm
Free Ammonia as NH_3	4 ppm
Iron	0.2 ppm
Color, APHA (10 gm. in 100 ml. methanol)	2
Turbidity, APHA (50 gm. in 100 ml. water at 25°C.)	5 ppm

TYPICAL ANALYSIS FOR SHOTTED UREA:

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Moisture	0.17%
Ash	18 ppm
Free Ammonia	150 ppm
Iron	0.3 ppm
Color APHA (10 gm. in 100 ml. methanol)	2
Turbidity, APHA (50 gm. in 100 ml. water at 40°C.)	6 ppm

HIGH-PURITY CRYSTAL UREA is proven in industry—the product of over 20 years of Du Pont research experience.

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DU PONT
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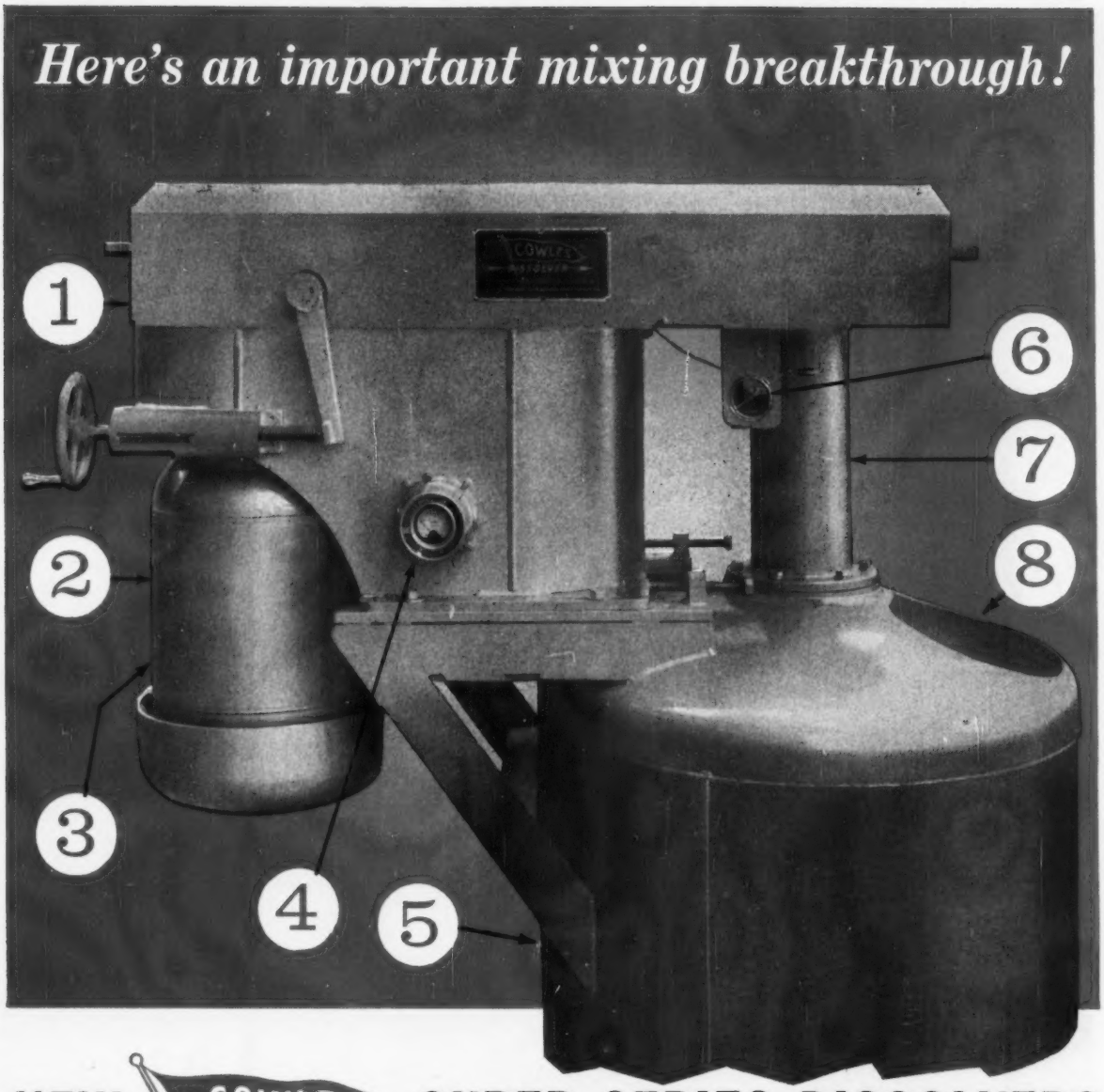

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Now Cowles application engineers have perfected methods of adapting efficient mixing equipment to stationary tanks ...of almost any size, anywhere. If you have such problems they can very likely help you solve them. Here illustrated, for example, is the solution for one prominent chemical processor.

In this case the unit is completely leak proof—sealed against vapor loss in processing. The unique Cowles principle makes this both efficient and practical.

Special services are offered to all engineers in customizing Cowles equipment to fit their particular needs.

All units assure the characteristic advantages of Cowles Dissolvers—big volume in small space...plenty of power for all speeds...self-cleaning, non-clogging impeller...low operating costs.

Consider these features as numbered above—■1-Bridge assembly including MPD* *(Maximum Power Delivery)* drive system ■2-Variable speed adjusting wheel ■3-Motor ■4-Ammeter, integral with unit ■5-Fixed tank ■6-Tachometer, integral with unit ■7-Vapor-tight housing for stainless steel impeller shaft ■8-Vapor-tight closure in tank *(Patented stainless steel Cowles impeller in tank, not shown)*

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This unique container combines chemical resistance, shipping and handling durability with low unit cost, minimum tare weight, and up to 50% storage space saving.

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Visit our booth at the AMA National Packaging Exposition . . . Booth 159, Convention Hall, Atlantic City, April 4-7. See for yourself how chemicals handle best, travel best, store best in CUBITAINER.

Write Hedwin Corporation, Baltimore 11, Maryland. Tell us what your product is, and we'll demonstrate what CUBITAINER can do for you.

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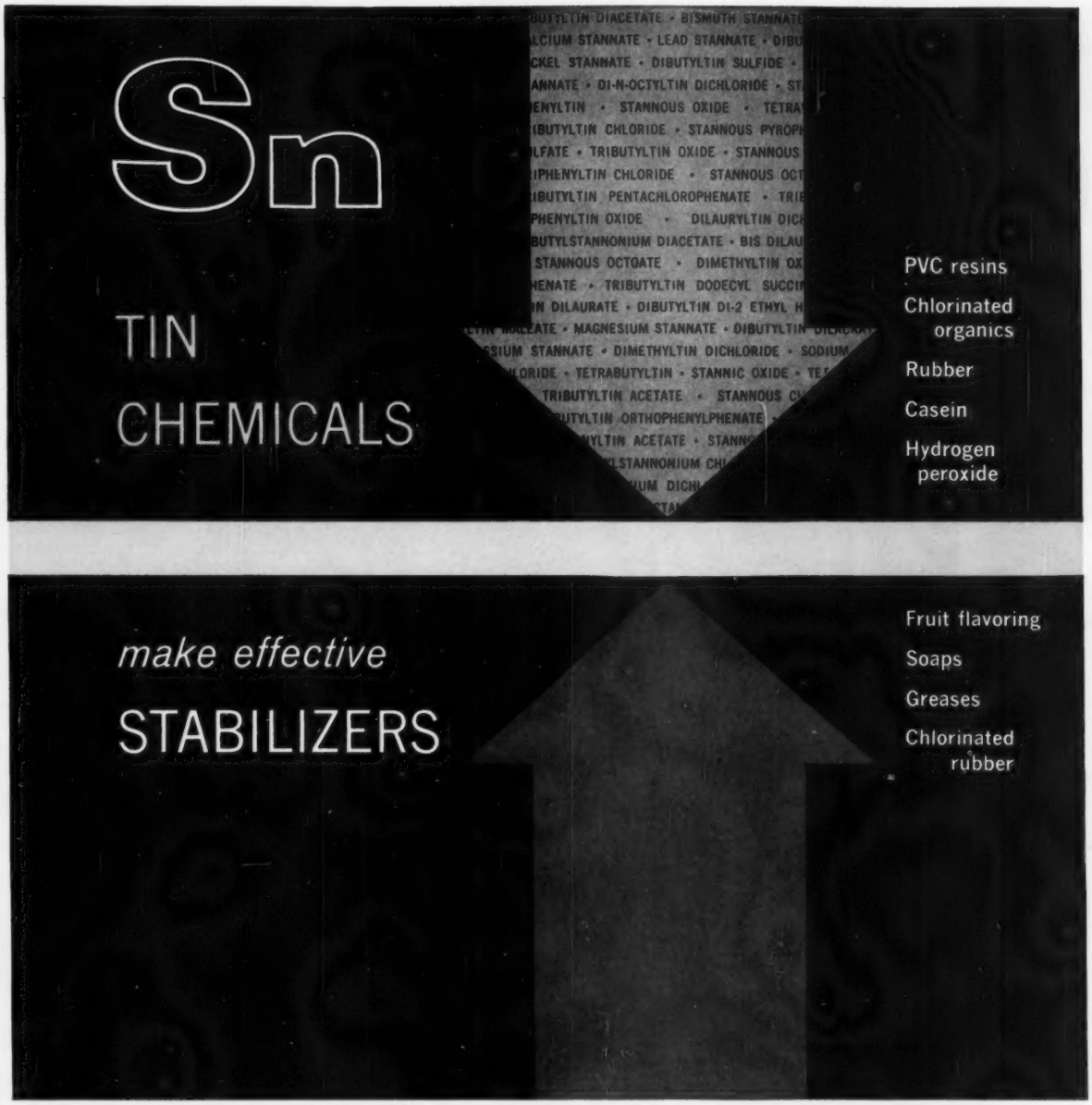

From resins and rubbers to foodstuffs and soaps, very small percentages of organotins and inorganic tin compounds have proved their ability to protect products against degradation through exposure to air, heat and light—or from the harmful catalytic effects of impurities or contaminants. The results have been entirely new life-expectancies or new application possibilities for a wide range of products.

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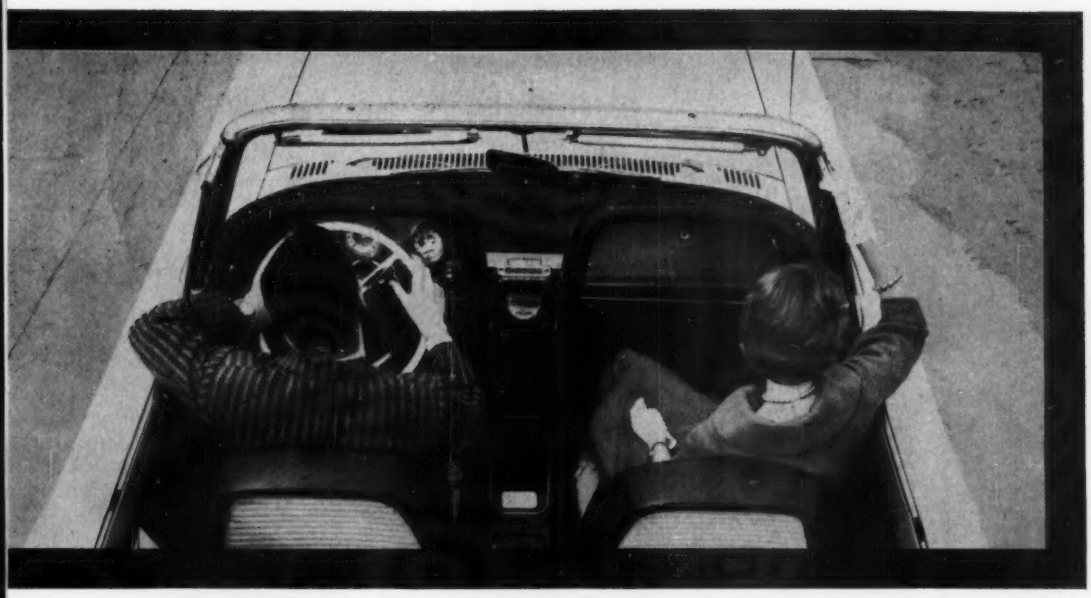
In Automobiles, Rubber Products and Toys—You'll Find

WITCO CHEMICALS AT WORK

AN EXTRA MARGIN OF DRIVING SAFETY AND COMFORT comes from dashboard panel crash pads and seat and arm rest padding made of flexible urethane foams prepared with Witco's Fomrez® Resins. These resins impart to the finished foam excellent physical and aging properties for tireless performance. And flexible foams made with Fomrez Resins resist chemicals and solvents... are ideal for clothing interlining – furniture and mattress cushioning. Witco Fomrez Resins for the manufacture of rigid foams, applied as insulation – structural reinforcement – potting and for flotation are also available. Whether you are interested in flexible or rigid urethane foams, there's a Witco Fomrez Resin of uniform quality and good handling and processing characteristics to fill the bill.

DURABLE PLASTIC DOLLS FOR LITTLE MISSES are made with the aid of Witco metallic stearates. Zinc stearate, incorporated into molding compounds or dusted onto mold surfaces, lubricates... minimizes ejection pressures, thereby eliminating breakage in the finished product. Other stearates produce firm stable gels with many hydrocarbon solvents. Witco metallic stearates exhibit remarkable versatility in other areas of industry. They are used to waterproof multitudes of materials, from paper to cement – facilitate mold release or extrusion of metals, ceramics, rubber – improve suspension of solids – alter the viscosity of numerous organic liquids.



WELCOME MATS TO GREET YOUR GUESTS are made of synthetic rubber produced by emulsion polymerization. The process is easier with Witco's Emcol K-8300. This emulsifier, which is also useful in the manufacture of adhesives from synthetic and natural rubber latex, offers excellent tolerance to electrolytes which coagulate conventional latices. It imparts to finished latices superior freeze-thaw stability and allows the preparation of low viscosity latices with high solids content. Emcol K-8300 stabilizes latices prepared with other emulsifiers against coagulation caused by mechanical agitation.

Other Witco quality chemicals for industry include:

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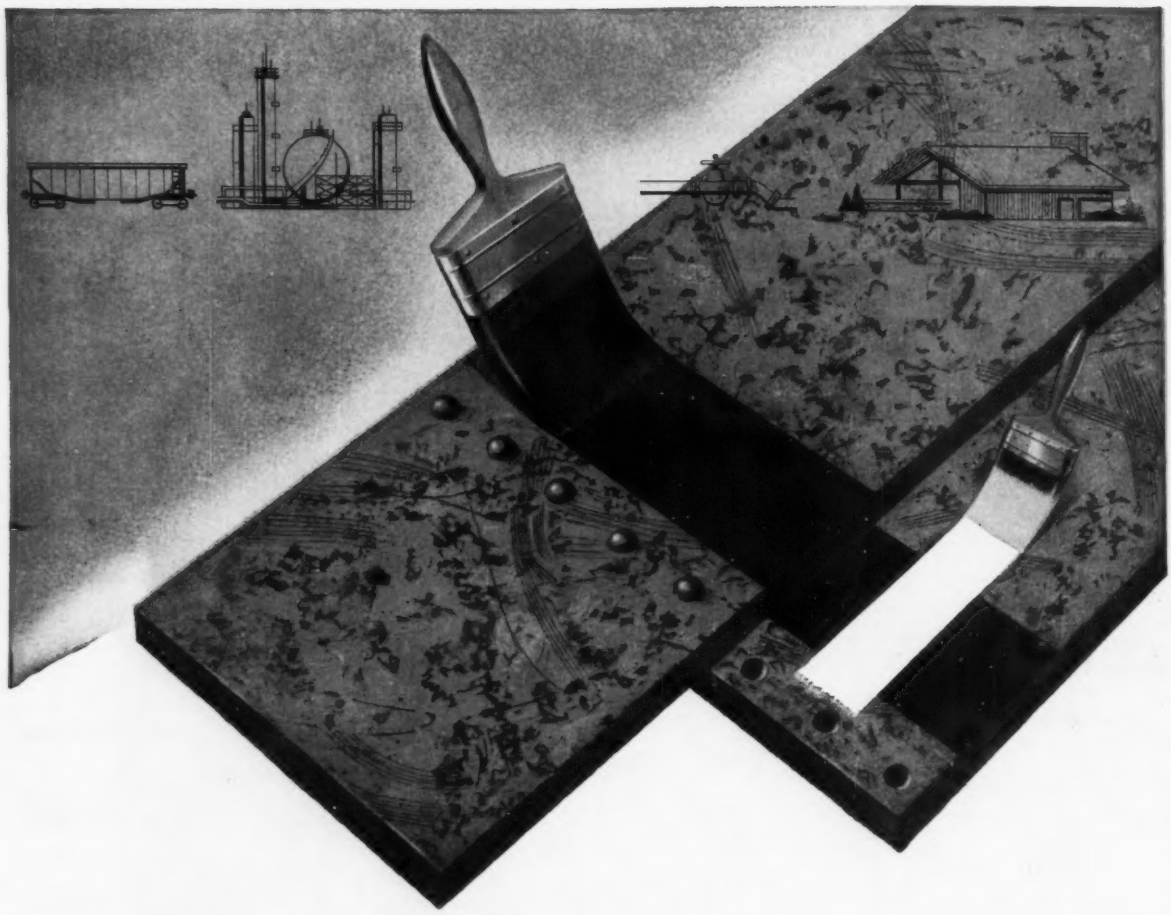

Important new development!

EPON® RESIN-BITUMEN C COATING— cold blend, high thermal stability

Now—for the first time—you can obtain complete compatibility between Epon resin and a heavy petroleum fraction.

Shell Chemical research has made it possible for you to combine Epon 828 liquid resin with a low-cost, petroleum-based material, *Bitumen C*. The resulting surface coating has a number of excellent properties never before attainable in a bituminous coating material:

- **Cold blending—no heating of pitch necessary**
- **Various film builds—up to 15 mils in one coat**
- **No pinholing—even in thin films**
- **Can be overcoated with white**
- **Imparts high thermal stability to bituminous coatings**
- **Permits use of conventional curing agents**
- **2-hour pot life**

This outstanding new Epon resin-Bitumen C coating is ideal for a wide range of anti-corrosion and waterproofing applications. To suggest just a few: pipelines, chemical plants, hopper cars, sewer pipe, waterproofing basements.

Both Bitumen C and Epon resin are available from Shell Chemical. Get off to a head start on this extraordinary new surface coating development by getting complete information. Write or phone your nearest Shell Chemical district office.

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SHELL

Business
Newsletter

CHEMICAL WEEK
March 26, 1960

American Potash & Chemical will spend $25 million in the next three years for capital improvements. Included in the program will be expansion of plants at Trona, Calif., and Aberdeen, Miss. Main new-product and process research, says company President Peter Colefax, will continue to be in boron chemistry, lithium compounds, yttrium and rare earths.

•

A big new phosphate project in Utah is getting the green light, despite three serious problems: low-grade ore, mine site not readily accessible, and regional markets not well developed. San Francisco Chemical —50-50 joint subsidiary of Stauffer Chemical and England's Mountain Copper Co.—says it has contracted with Western Knapp Engineering Co. (Salt Lake City) for immediate start of construction on the first of six ore beneficiation units at a site 12 miles north of Vernal, Utah (*CW, Jan. 9, p. 26*). Temporarily, at least, the concentrates will go by truck over 180 miles of rough terrain to Garfield, Utah, where they will be processed by Western Phosphates, Inc. (owned 50% by Stauffer, 25% by Kennecott Copper, 25% by American Smelting and Refining).

This go-ahead decision came on the day that President Eisenhower signed into a law a bill that authorizes the Secretary of the Interior to issue permits to prospect for phosphate ores on federally owned lands. Permits would be good for up to 2,560 acres and run for two years.

•

But Stauffer's plans for a soda ash project have hit another snag. Hills and Wagner, Denver geologists, reportedly have filed applications for lease of 60,000 acres of oil shale land on top of leases obtained by Stauffer for trona mining near Rock Springs, Wyo. Stauffer has told the Wyoming Board of Land Commissioners that oil shale development and trona mining aren't compatible. Currently, Stauffer is trying to find a way to mine the trona without interfering with the canals in the proposed Seedskadee irrigation project (*CW, Jan. 30, p. 24*).

•

Methanol and formaldehyde expansions are ticketed for Allied Chemical this week. Its Nitrogen Division will increase capacity for both these products at its South Point, O., plant. Methanol capacity will be upped 50%; formaldehyde, 35%. The increase is slated for the company's urea-formaldehyde resin products.

•

And Pennsalt is building a new alkyl alkanol amines plant at Wyandotte, Mich. Estimated to cost $1.5 million, the unit will triple Pennsalt's production of this class of amines—which are used in local anesthetics, antihistamines, textile lubricants, and as emulsifiers for wax polishes and ion exchange resins.

Scandinavia's first polyethylene plant will be a joint venture between Britain's Imperial Chemical Industries and two Danish firms, A/S Dampskibsselskabet Svendborg and Dampskibsselskabet AF 1912 A/S, owners of the Maersk refinery at Copenhagen. The 15,000-l.t./year plant will go up alongside the refinery, will use ICI's high-pressure process. It will be operated by a new subsidiary, Danbritkem A/S, with the British and Danish partners contributing an equal share of the $11.2 million capital.

•

Hooker is going ahead with investment plans in Argentina, despite mounting political tensions. Pending successful negotiation of "a substantial loan" by the U.S. Export-Import Bank to Hooker's partner Atanor, Compania Nacional para la Industria Quimica (Buenos Aires), Hooker will hold a minority interest in a projected 25-metric-tons/day phenol plant. The companies have set up a new joint subsidiary, Duranor, Industrias Quimicas Sociedad Anonima Industrial y Comercial.

Texas Butadiene and Chemical is also going ahead with investment plans in Argentina via its $30-million synthetic rubber and carbon black plant recently approved by the government *(CW, Feb. 13, p. 24).*

•

Quick rundown on latest expansion and diversification moves:

• Union Carbide Chemicals Co. has decided what to do with the former Carthage Hydrocol plant site at Brownsville, Tex. (*CW Business Newsletter, Dec. 6, '58*). Among principal products: acetic acid, acetic anhydride, and methyl ethyl ketone. Carbide has awarded a contract to Brown and Root (Houston, Tex.) for more than $2.5 million worth of construction and remodeling, expected to be completed early in '61.

• General Dynamics—which refuses to confirm or deny the report—has been identified as the leading prospect for purchase of the government-owned chemical plant at Morgantown, W. Va. (*CW, Nov. 14, '59, p. 199*).

• Continental Carbon Co. plans to build a $2.5-million, oil-furnace carbon black plant at Bakersfield, Calif. This 30-million-lbs./year facility would be the first carbon black plant on the West Coast.

• Phillips Chemical—which so far has specialized in high-density (linear) polyethylene—will now market some of the medium- and low-density resins produced by National Distillers and Chemical Corp.'s Houston plant—which gets its ethylene from Phillips.

• Allied Chemical—which up to now has marketed nylon-6 largely in the forms of heavier yarns for tire cord and upholstery—will start in mid-'61 to produce and sell fine-denier nylon-6 yarns for apparel. Technical assistance in the new venture will be furnished by Snia Viscosa S.p.A. (Milan, Italy).

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Why you won't find technical service in the Yellow Pages

WYANDOTTE CHEMICALS

You can't reduce Wyandotte technical service to a few lines of type in the Yellow Pages of a telephone directory.

Even a dozen listings, under a dozen different headings, wouldn't come close to giving you the full picture of what it is and what it can do for you.

You see, Wyandotte technical service is more than a service, more than a department. It's a working philosophy that permeates the entire organization of the Wyandotte Chemicals Corporation.

It's a philosophy whose basic principle is helping our customers get the best possible results from the Wyandotte products they buy.

This broad concept necessarily requires that the functions of Wyandotte technical service cross *all* corporate lines—from research and development and raw material procurement to shipping, storage, and safety.

So, quite naturally, you *won't* find Wyandotte technical service in the Yellow Pages. It's too big for that.

But if you feel that Wyandotte technical service might be able to help you, send us all the information you possibly can on your product or processing problem. Address this data to Technical Service, Wyandotte Chemicals Corporation, Wyandotte, Michigan, and we'll do our best to help you solve your problem.

For a pictorial presentation of Wyandotte technical service at work, please turn page.

SODA ASH • CAUSTIC SODA • BICARBONATE OF SODA • CALCIUM CARBONATE • CALCIUM CHLORIDE • CHLORINE • MURIATIC ACID • HYDROGEN • DRY ICE
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Safe handling of Chlorine

. . . an example of Wyandotte technical service at work

1 Wyandotte technical service prepares complete manuals on the safe handling of chlorine . . . recommends equipment for unloading systems, helps in designing new processing equipment, suggests suitable materials of construction, and provides detailed cost estimates.

2 Wyandotte technical service men periodically visit customer installations to inspect handling and packaging of chlorine. Here, a technical service man checks bottling procedures and equipment in a customer's plant to ensure maximum safety and efficiency.

3 Plant personnel get an intensive review of all phases of safe-handling techniques, first-aid measures, and emergency procedures from the Wyandotte technical service man. Wyandotte's excellent safety record in the chlorine industry is the result of continuing vigilance.

4 When the initial tank car of Wyandotte chlorine arrives, the technical service man is on hand to assist in the unloading. He checks the entire operation, making sure all the various safety devices are fully understood. Only then is the Wyandotte chlorine unloaded.

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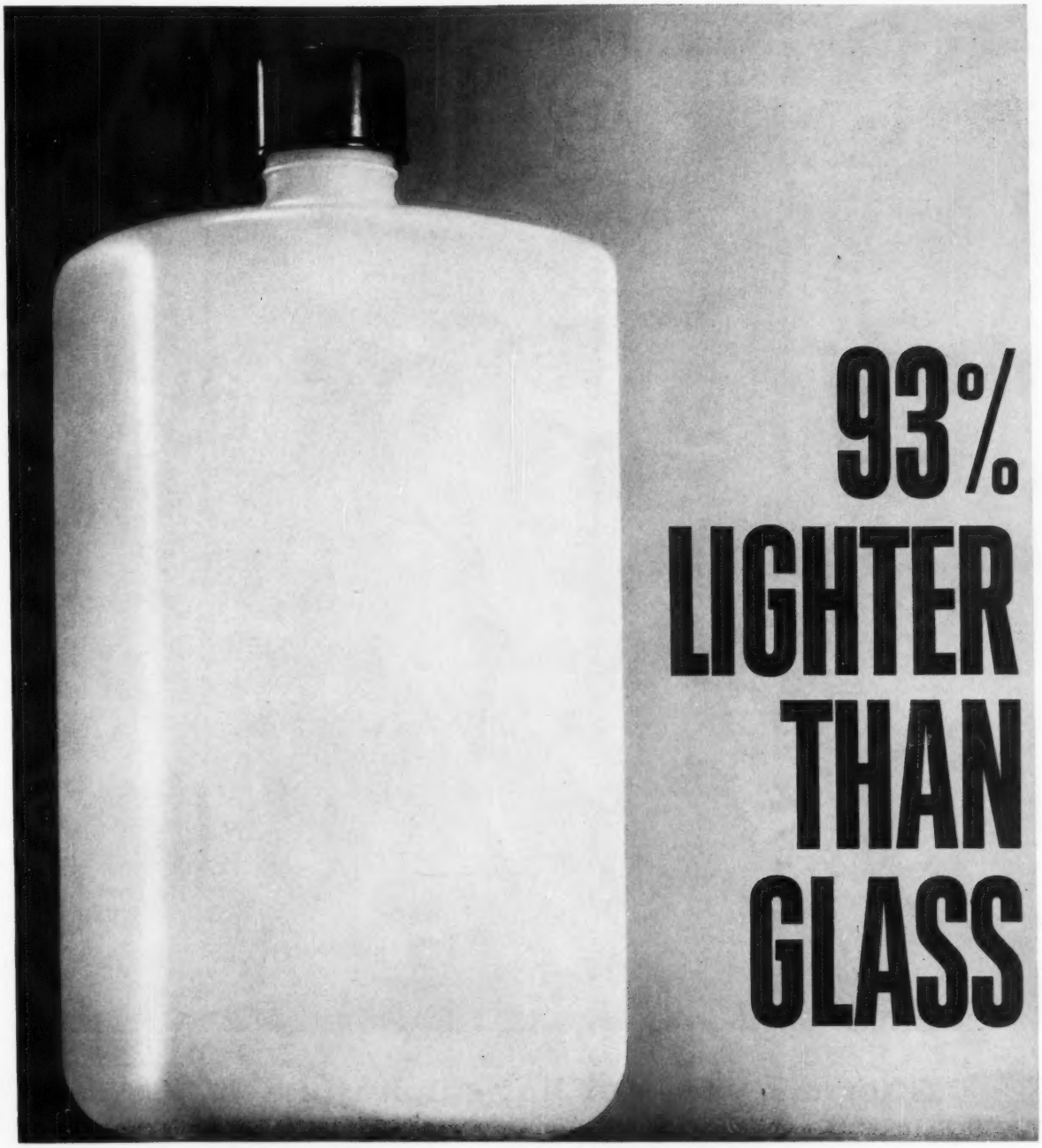
Wyandotte technical service is with you *every* step of the way when it comes to the safe handling of chlorine. In fact, whatever chemical you buy from Wyandotte, it's the specific job of our technical service department to see that you get the service and technical assistance you need to use the product most efficiently. If you have a problem that falls within our technological or manufacturing background, check with us . . . our approach is designed to provide answers. *Wyandotte Chemicals Corp., Michigan Alkali Division, Wyandotte, Mich. Offices in principal cities.*



SAVES 37% IN BULK SPACE ★ INCREASES SHIPPING PAYLOAD 18%

This new Plax square gallon container, made of tough, shatterproof polyethylene, will save you money. It weighs about 2½ lbs. less than glass jugs of the same capacity, and holds a great variety of products—from shampoos to corrosive chemicals. ★ Half-gallon size also available. For *free literature* on the Plax gallon and other industrial containers, and the name of our distributor near you, write Dept. A:

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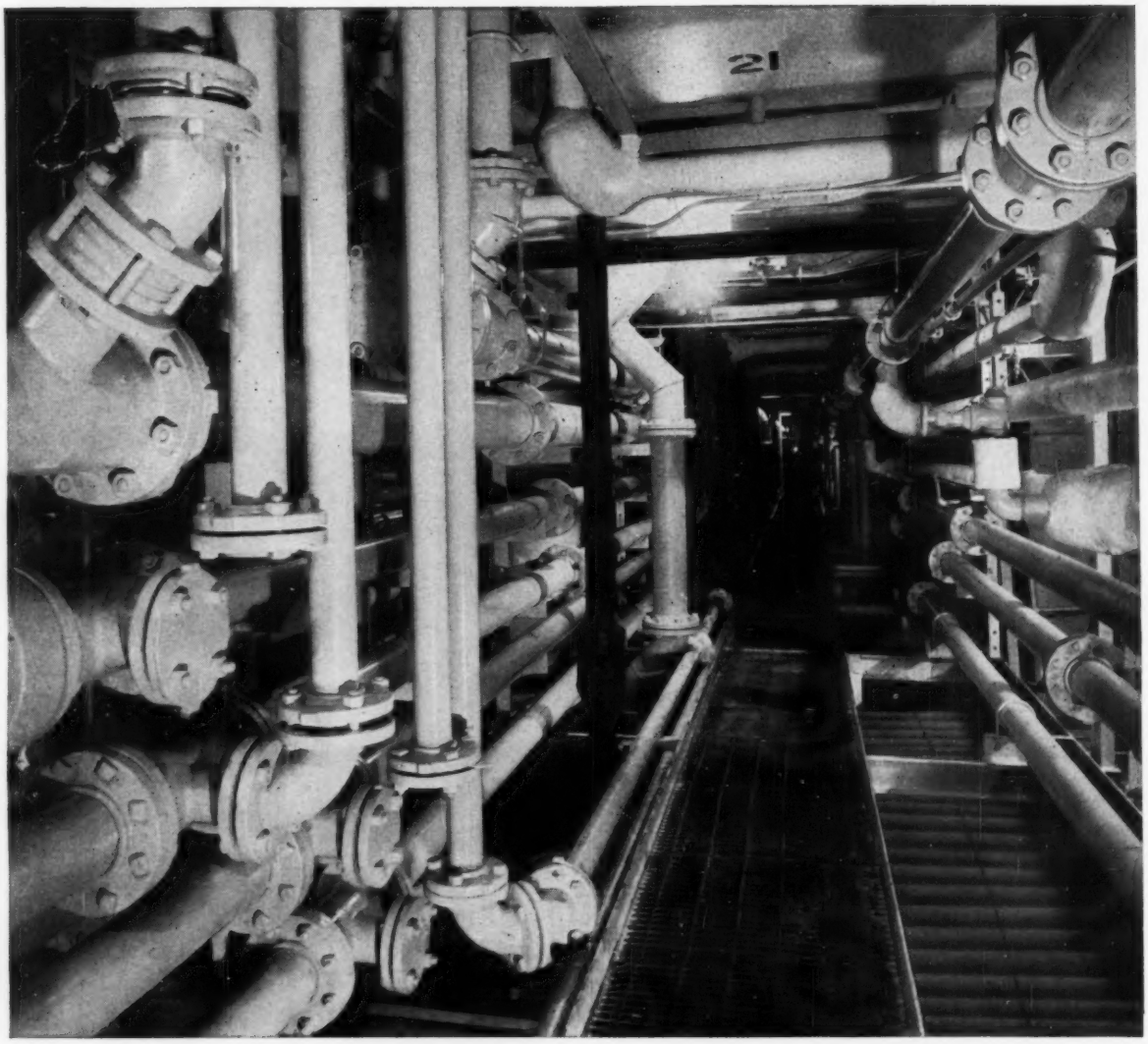
DOW | **SARAN LINED PIPE**



After six years of hot sulphuric acid . . .

Saran Lined Pipe still performs dependably

When 20,000 linear feet of pipe must carry a constant stream of hot sulphuric acid . . . when production requirements make pipeline failure intolerable . . . pipeline dependability is the lifeline of the plant. For the past six years, Saran Lined Pipe has carried dependably an unending flow of corrosive chemicals at Industrial Rayon Corporation's Painesville, Ohio, plant.

The installation shown above carries hot sulphuric acid and other chemicals used in Industrial Rayon's Continuous Process method of making tire cord. This Saran lined supply and return piping, serving all of the plant's spinning machines, carries the solutions from lower levels to spinning machines on the main floor. Pumping pressures range from 45 psi upward, and solution temperatures are above 125° F.

The Saran Lined Pipe was installed in 1953 and has been in continuous use since. Maintenance costs have been extremely low and I.R.C. engineers report that, during these six years, Saran Lined Pipe has performed dependably under their corrosive operating conditions.

Whenever dependable piping systems are required, whatever the degree of corrosion or chemical activity, consider Saran Lined Pipe. Saran Lined Pipe, fittings, valves and pumps are available for systems operating from vacuum to 300 psi, from below zero to 200° F. They can easily be cut, fitted and modified in the field without special equipment. For more information, write Saran Lined Pipe Company, 2415 Burdette Avenue, Ferndale, Michigan, Dept. 2282-AM3-26.

See "The Dow Hour of Great Mysteries" on NBC-TV

THE DOW CHEMICAL COMPANY • MIDLAND, MICHIGAN

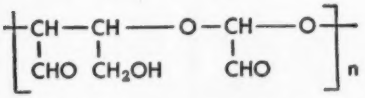
MILESTONES IN CHEMISTRY

published by Miles Chemical Company, Elkhart, Ind.

Old friend, new talents

About the same time the alchemists were run out of town, the selective oxidation of 1, 2-glycols by periodate ion was discovered.

And back during Roosevelt's second term, two fellows name of Jackson (Ernest L.) and Hudson (C. S.) applied the technique to starch. They established the formula of the product resulting from this specific oxidation. It went like this:



And there it sat for some 15 years. Every now and then someone would put it to use for structure studies. But the reaction stayed snugly in the area of laboratory interest.

Some 15 years later, Dvonch and Mehltretter of the Northern Utilization Research Branch, U.S.D.A., took this neglected treasure and did something with it. Specifically, they made practical an electrolytic technique whereby the periodate oxidant was continuously regenerated *in situ* from the iodate formed. This effectively overcame the limitation of high-cost periodic acid.

In short, they lowered cost to the point where a businessman could afford to experiment with it. That's where Miles Chemical Co. entered the scene. Read on to find out what happened.

SUMSTAR™ versatility

Miles had more than a passing knowledge of electro-organic chemistry. What's more, the Dvonch-Mehltretter patents showed the way to a product of unusual structural versatility . . . the sort of one-man band traits that promised many interesting applications.

There followed some intensive research and development, out of which came the first commercialization of a process for dialdehyde starch. Product trade name: SUMSTAR.

SUMSTAR is produced at three levels of oxidation. SUMSTAR-S is over 90% oxidized. SUMSTAR-R is 75-80% oxidized. SUMSTAR-J is 50% oxidized. All three are fine powders, nonvolatile, and virtually odorless. Acute toxicity is only a fraction of that of other commercially available aldehydes.

Frankly, SUMSTAR is so new that we don't know where-all it will prove of value. So far, the tracks lead to excellent possibilities in adhesives, leather, tobacco, plastics, and paper. It appears that SUMSTAR opens up limitless vistas for new products and modifications of your present products. Many synthetic and natural materials can be cross-linked to varying degrees by using SUMSTAR. Key to the whole thing is the manner in which the highly specific periodate ion breaks the carbon-to-carbon bond between the second and third carbon atoms of the anhydroglucose units of the starch molecule, forming two aldehyde groups.

Some of the things we know about SUMSTAR are in our bulletin No. 6-129. This bulletin and samples are available on request. Just write.

Build you a molecule?

Every now and then every chemical company has the urge (or need) to do violence to its everyday inventory of molecules. And frequently this calls for the use of a unit process which can't be handled with the existing plumbing.

That's where Miles Chemical Co. may be a handy friend. The Zeeland, Michigan, plant has the facilities and people needed to carry through some 18 unit processes with dispatch.

These include: reduction (catalytic and chemical), reductive amination, oxidation, electro-organic synthesis, Friedel-Crafts, Kolbe, Claisen, and other classical reactions, esterification, distillation, acylation and alkylation, resolution of optical isomers, amination, halogenation, and cyanation.

Knowing the economics of this business as well as you do, it's easy to see why we're not eager for small-batch custom work. But frequently we've found folks we can work with to mutual benefit. If it looks like that's the situation in your case, let's get together and talk about it.

Can Miles speed you to your next milestone?

There are several ways in which Miles Chemical Co. has been able to help customers reach their goals a little faster.

First of all, Miles produces an interesting range of useful products. These include citric acid U.S.P., a series of antioxidants, SUMSTAR (dialdehyde starch), several interesting aromatic amines, and many other products in the fine chemical area.

Secondly, Miles has the facilities and the resourceful people to take on projects which involve tailoring existing products (yours or ours) to fit special needs.

Finally, your problem never becomes lost in a corporate maze at Miles. You work with an eager, inventive group of experienced research and development people . . . all anxious to speed your progress to your next milestone. Get in touch and see what we have to offer.

Miles Chemical Company

division of Miles Laboratories, Inc.

Elkhart, Indiana

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6-60

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world headquarters for
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HS-CH2-COONH4
Benzyl Mercaptan
⬡-CH2-SH
S-Benzylthioglycolic Acid
⬡-CH2-S-CH2-COOH
Calcium Thioglycolate
S-CH2-C(=O)-O
Ca
· 3H2O
Carboxymethylmercaptosuccinic Acid
HC(COOH)-S-C(H)(COOH)-CH(COOH)
p-Chlorothiophenol
Cl-⬡-SH
2-Diethylaminoethanethiol HCl
HCl · (C2H5)2N-CH2CH2-SH
a,a' dimercapto-p-xylene
HS-CH2-⬡-CH2-SH
2-Dimethylaminoethanethiol HCl
HCl · (CH3)2N-CH2CH2-SH
Diphenyl Disulfide
⬡-S-S-⬡
Glycol di-mercaptoacetate
HS-CH2C(=O)-O-CH2OH2-O-C(=O)CH2-SH
Iso-octyl 3-Mercaptopropionate
HS-CH2CH2-C(=O)-O-(C8H17)
Iso-octyl Thioglycolate
HS-CH2C(=O)-O-(C8H17)
2-Mercaptoethylamine HCl
HCl · NH2-CH2CH2-SH
3-Mercaptopropionic Acid
HS-CH2CH2COOH
Methoxyethyl Thioglycolate
HS-CH2-C(=O)-O-CH2CH2-O-CH3
Monochlorhydrin
HC(OH)-C(OH)H-CH(Cl)
Monoethanolamine Thioglycolate
HS-CH2COONH3-CH2CH2-OH
Phenylmercaptoacetic Acid
⬡-S-CH2COOH
Sodium Thioglycolate
HS-CH2-COONa
Thioanisole
⬡-S-CH3
Thiobenzoic Acid
⬡-C(=O)-SH
Thiodiglycolic Acid
HOOCH2-S-CH2COOH
Thiodipropionic Acid
(HOOC-CH2CH2-)2S
Thioglycerol
CH2(OH)CH(OH)CH2SH
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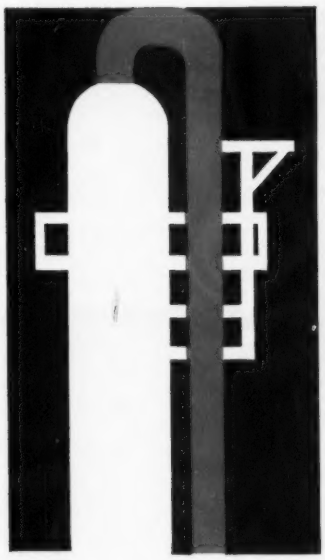

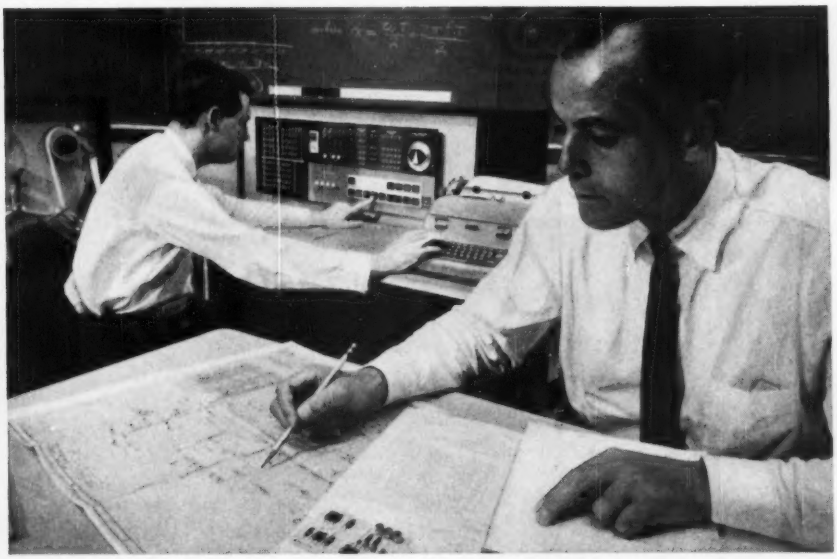

In the Chemical Industry the IBM 1620 solves problems like these:

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- *reactor design*
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The new IBM 1620 is a desk-size engineering computer that offers you more computing ability per dollar than any system in its price class.

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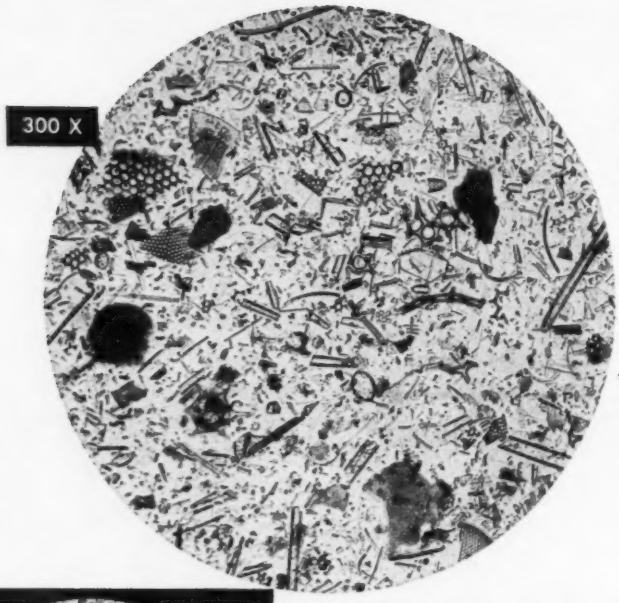
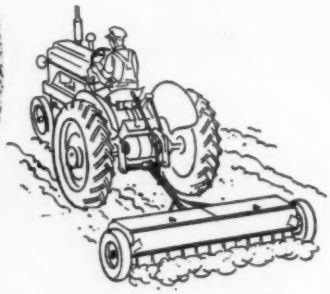
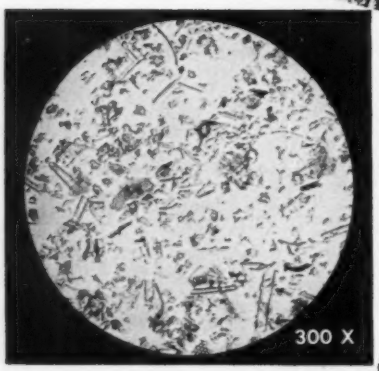
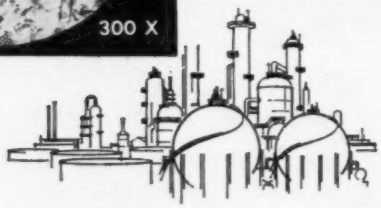


For fertilizer coating—Celite 379, a natural milled diatomite, provides the uniform conditioning needed to prevent caking of granular, mixed or prilled fertilizers—maintains good free-flow characteristics even after prolonged storage.

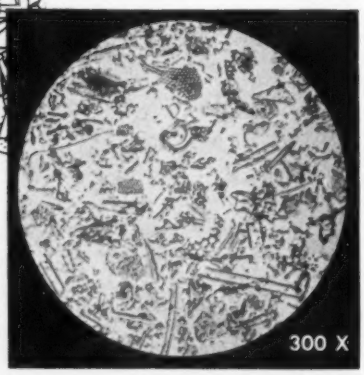




For catalyst carriers—Super Floss, finest particle size flux-calcined Celite grade, is used where a non-reactive porous silica support is needed. (Also available: special Celite supports in many preformed shapes for strength, high temperature stability, resistance to abrasion and attrition.)



As a paint-flatting agent—Celite 281, air-floated fines of flux-calcined diatomite, provides uniform and efficient flatting at low cost. Contributes to control of low angular sheen, durability, and faster drying.



In diatomites, Johns-Manville precision processing works for you

Celite diatomite absorbs its own weight of liquid . . . yet stays 'dry'

No matter which of the many available grades you choose, you can depend on a given volume of inert Celite* to retain its typical dry-powder characteristics even after absorbing its own weight of liquid.

Actually, Celite can absorb a total of more than twice its own weight. That's because a mass of the fine skeletal particles is approximately 93% air space or voids. Yet, in spite of this very high porosity, Celite is essentially non-hygroscopic.

Other unique properties—extremely high bulk, irregular particle shape and large available surface area—ideally suit Celite to hundreds of mineral filler applications. It is produced with precision from the world's purest commercially available diatomite deposit. It offers a wide choice of grades, each carefully controlled for complete uniformity.

For technical data on specific mineral filler or filtration problems, talk to your nearby Celite engineer. Or write to Johns-Manville, Box 14, New York 16, N. Y. In Canada, Port Credit, Ontario.

*Celite is Johns-Manville's registered trademark for its diatomaceous silica products

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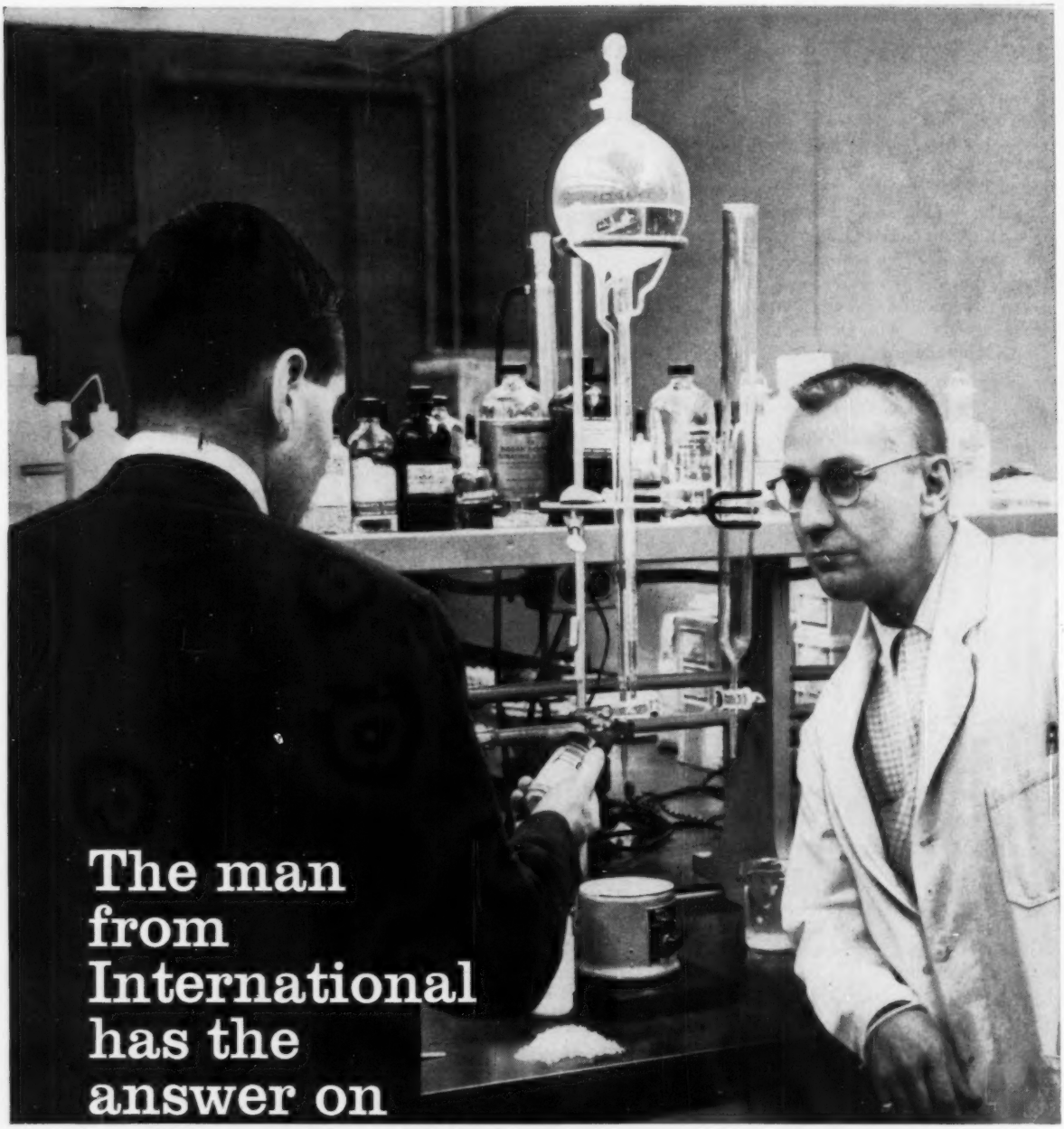


The man from International has the answer on salt selection

The International Salt Company sales engineer is helping his customer choose the right salt and a matching salt-dissolving system for a new plant. His advice is sure to be impartial because International supplies Sterling Salt in over 80 different types. In this full line, there is a type and size of salt for every industrial need. The man from International can also suggest the most efficient and economical method of using, storing and handling the salt he recommends. His experience, knowledge and on-the-spot service are the vital extras that make Sterling Salt the first choice of so many salt-using companies. To put this technical knowledge at your disposal—contact International Salt Company headquarters, Clarks Summit, Pennsylvania, or the office nearest you: Boston, Buffalo, Charlotte, Chicago, Cincinnati, Detroit, Newark, New Orleans, New York, Philadelphia, Pittsburgh, St. Louis.

INTERNATIONAL STERLING SALT SALT COMPANY

"A STEP AHEAD IN SALT TECHNOLOGY"

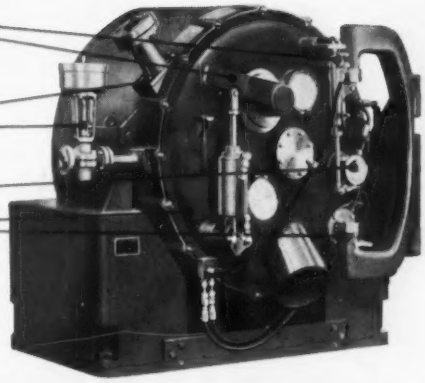
All parts which control action inside are located outside —no danger of contamination, corrosion or erosion to pneumatic or hydraulic equipment, etc.

Process piping extends through vessel wall— door opens without piping disconnection.

Simple external adjustments of knife, cake, etc.

Finger-tip double-acting door, automatic positioning; effective pressure closure; positive locking.

Built to handle full 150 HP, in high capacity, day-in, day-out operation.



PROVEN PERFORMANCE!

FOR EXTRA HIGH PURITY AND SOLIDS DRYNESS

(even on slow draining, compressible fine solids)

Full hydraulic rotary-action knife unloads 300-400 lbs. load in 2-8 seconds with full 150 HP.

Six-section knife blade, easily adjustable and replaceable by identical sections at low cost.

Full-flow, air operated feed system delivers slurry uniformly across full width of basket.

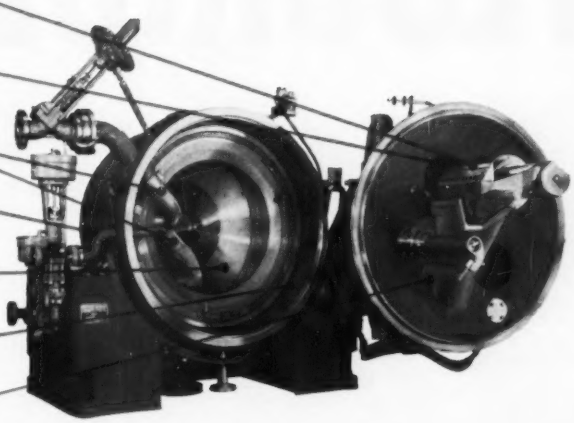
Multiple rinsing system; disconnect rinse tube internally without disturbing external piping.

Large screen area; thin even layer of solids under high centrifugal force, gives up liquid quickly without compaction.

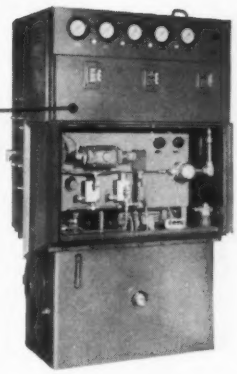
Teflon "splash seal" (hidden) prevents flow-back of crystals into mother liquor.

Smooth action cake leveler balances load; easily adjustable to control cake thickness.

Precision drive and bearing assembly; sealed housing with pressure lubrication system from control cabinet.



Continuous cyclic operation at full speed, with fully automatic control. Any part of the cycle may be adjusted while the machine is in operation.



Over a dozen C-41 Super-D-Hydrators already are proving themselves profitable workhorses in the deliquefication of such sensitive materials as the polyolefins and other hydrocarbons where high purity and extreme dryness are the byword.

In the C-41 you are sure of full power, flexibility, ruggedness, and proven performance. Write for Bulletin 1286 for full details.

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HARSHAW FLUORIDES

Harshaw first started to manufacture hydrofluoric acid in 1904. Today, Harshaw's Fluoride Division produces 26 different fluoride chemicals for as many industries.

In addition to

BORON TRIFLUORIDE

HYDROFLUORIC ACID—Aqueous-Anhydrous

there is a long list of other fluoride chemicals. If necessary, you are invited to draw on the experience of our staff of technical specialists.

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HARSHAW ALSO SUPPLIES:

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- Frosting Mixtures
- Hydrofluoric Acid Anhydrous
- Hydrofluoric Acid Aqueous
- Hydrofluosilicic Acid
- Laboratory Fluorine Cells
- Lead Fluoborate
- Lithium Fluoride
- Metallic Fluoborates
- Potassium Bifluoride
- Potassium Chromium Fluoride
- Potassium Fluoborate
- Potassium Fluoride
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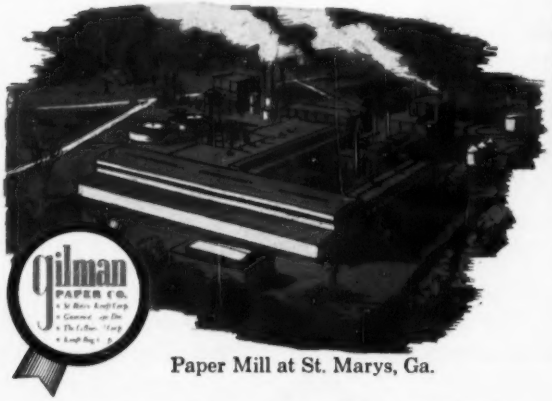
"It wasn't there last year!"

This is the new 300,000 sq. ft. addition to Kraft Bag Corporation's converting plant at St. Marys, Georgia, scheduled to go "on stream" in February.

Here, in one giant integrated operation, logs from our own forest lands are turned into pulp, then into paper, and finally into heavy duty multiwall shipping sacks, using the most modern machinery and equipment the industry affords.

This expansion of our facilities is one more step in our constant efforts to provide our customers with the best in quality and service.

We invite your inquiries.



Paper Mill at St. Marys, Ga.

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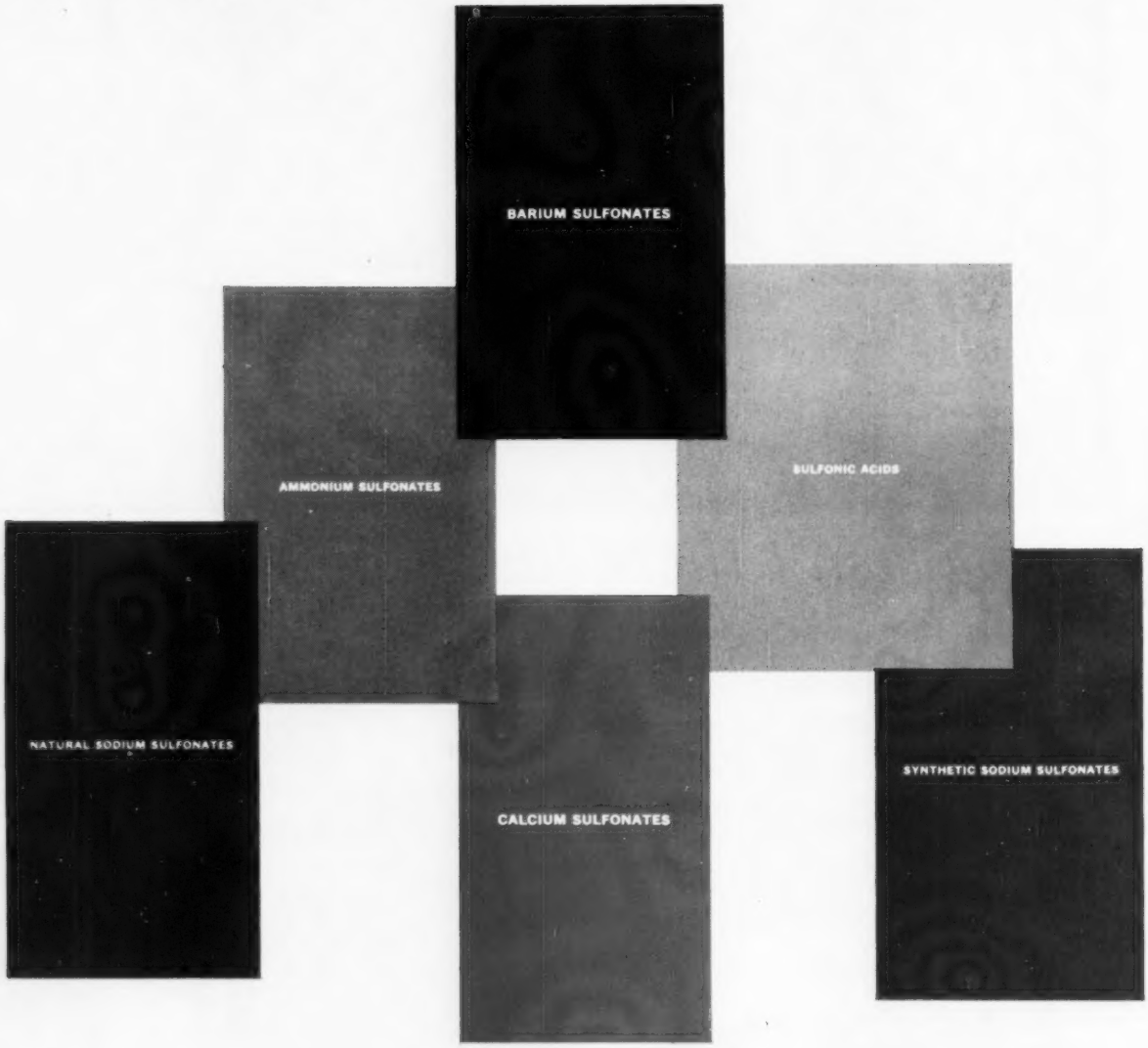

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Bryton has the specific sulfonate for you. Our ability to overbase alkaline earth sulfonates plus an improved sulfonation process assure a diversified series of sulfonates of uniform quality. Bryton's research laboratories, developers of HYBASE® Barium Sulfonate (65 Base Number), carry on a continuous program to develop new and improved products.

By calling on Bryton to answer your sulfonate requirements, you avail yourself of our broad experience and know-how to serve you better.

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European Address: P.O. Box 1207, Rotterdam, The Netherlands

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Specific Sulfonates for Industry

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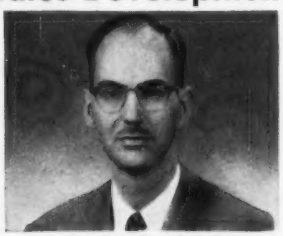
Manager Sales Development

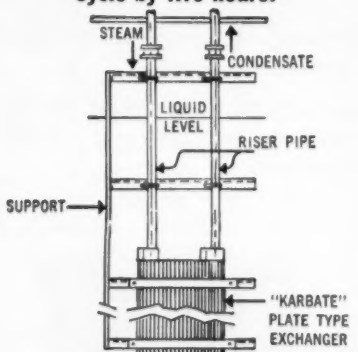


W. M. Gaylord

Mr. Gaylord was graduated from Yale University in 1942 with a B. S. in Chemical Engineering. He joined National Carbon Company in 1943. Much of his work has been devoted to designing and improving existing designs of carbon, graphite and "Karbate" impervious graphite equipment such as: pumps, heat exchangers, absorption equipment and entrainment separators.

Mr. Gaylord is well known for his work on HCl absorption, having written a number of technical papers on the design of falling film type HCl absorption equipment. A registered professional engineer, in 1957 he was appointed Manager – Sales Development, Chemical Products Marketing.

"Karbate" Plate Heater Installation Reduces Process Cycle by five hours.



Eight "Karbate" impervious graphite plate heaters are used by a plant turning out phospho-organic intermediates for pesticides manufacture. These units (which replaced eight alloy units) are handling a mixture of phosphoric and hydrochloric acid plus organic materials.

With the installation of eight "Karbate" impervious graphite plate heaters the user was able to reduce the production cycle in this application from 19 to 14 hours. It is expected that a modification of the steam piping arrangement will make further savings possible.

"KARBATE" IMPERVIOUS GRAPHITE HEAT EXCHANGERS COMBINE LONG LIFE, CORROSION RESISTANCE AND LOW MAINTENANCE

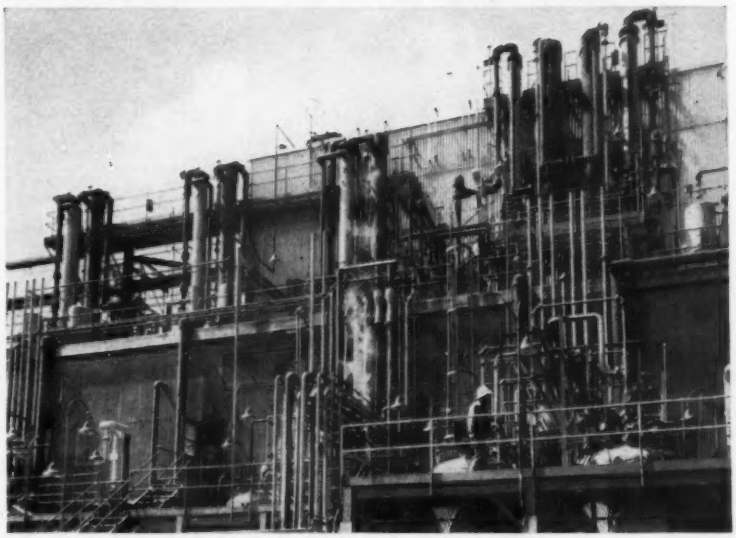


Photo shows a series of "Karbate" shell and tube heat exchangers condensing acid – containing vapors in an organic chemicals plant.

LONG LIFE – "Karbate" Condensers Last 5½ Years Longer Than Metal Units in a Tough Corrosive Service.

The unsurpassed corrosion resistance of "Karbate" impervious graphite makes it an excellent material of construction for shell and tube condensers handling corrosives on both sides. In this service, propylene dichloride with traces of HCl was condensed on the shell side using sea water as the coolant on the tube side.

The condensers have been operating for six years with little maintenance. Metal units in the same service have to be re-tubed about every six months because of excessive corrosion on the active condensing surfaces.

CORROSION RESISTANCE—One "Karbate" Exchanger Does the Work of Two Metal Units.

The absence of corrosion products enabled a single 1,290 square foot "Karbate" impervious graphite exchanger to handle the same heat transfer as two steel units each of equivalent area. After one year in a brine cooling application, the steel units accumulated excessive amounts of rust and mud which impaired their heat transfer. Inspection of the "Karbate" impervious graphite unit after a similar time, showed the tubes to be "clean as a whistle" on both sides.

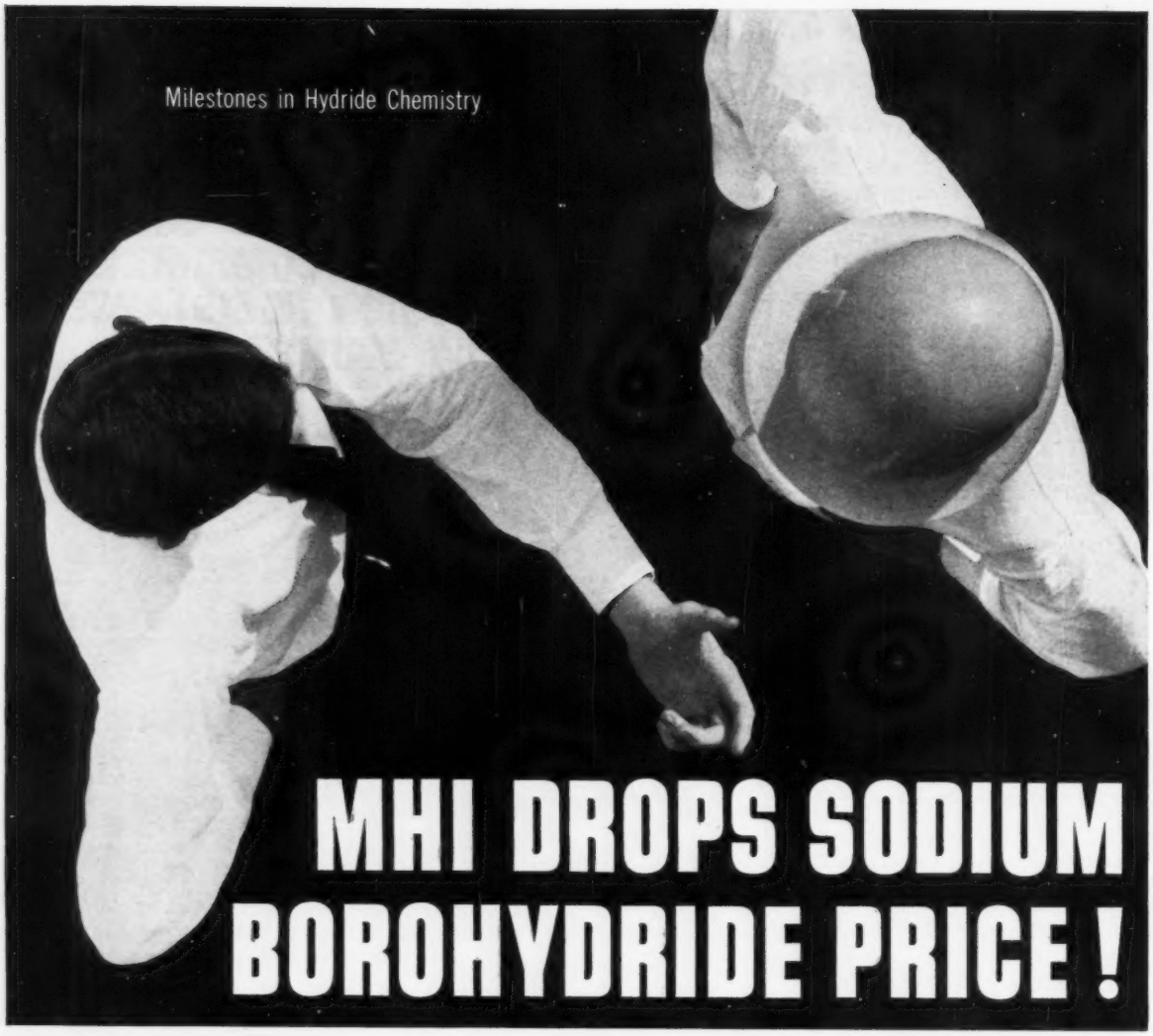
LOW MAINTENANCE – Ten Years of Trouble-free Service Concentrating H_3PO_4.

Two 110-tube heat exchangers show the low maintenance advantages of "Karbate" impervious graphite material. These units have provided ten years of service concentrating phosphoric acid from 20% to 75%.

Outside of an occasional cleaning, the user says, these units have required little maintenance over this ten year period.

NATIONAL TRADE-MARK

"National", "Karbate", "N" and Shield Device and "Union Carbide" are registered trade-marks of Union Carbide Corporation.
UNION CARBIDE



MHI DROPS SODIUM BOROHYDRIDE PRICE !

$19.90 PER POUND* is the new price for high-purity MHI sodium borohydride, in quantity lots of 5,000 pounds. This is the lowest price ever offered for 98% pure sodium borohydride powder. Increased commercial use, perfected processing techniques, and expanded production facilities have made this new price break-through possible. Remarkably stable, sodium borohydride is easily used with complete safety in standard equipment. It is shipped in polyethylene-lined, 55-gallon drums.

The new price should put sodium borohydride within the economic reach of many processors looking for a powerful, high-yield reducing agent for aldehydes, ketones, peroxides and acid chlorides. Others can now take advantage of its proven effectiveness for continuous fixed-bed, in-stream "clean up" of carbonyl or peroxides from gaseous or liquid olefins, diolefins, alcohols and glycols, amines and amino-alcohols, ethers and polyethers, acrylonitrile and chlorinated hydrocarbons. For producing better vinyl foams, sodium borohydride offers versatile and inexpensive process possibilities using simple equipment.

This new price combined with the reducing power and flexibility of sodium borohydride may well justify your immediate inquiry for complete information.

Do you have these new technical publications?
If not, write today.

The Mixed Hydrides Organic Reductions
$NaBH_4$ in Cellulose and Sugar Chemistry
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For technical service . . .
Contact MHI now. Over 20 years' experience, plus the recent assignment of exclusive patent rights for the manufacture of sodium borohydride and its organic reduction applications, qualifies MHI as an exceptionally helpful source for technical service.

*Domestic Price

PIONEERS IN HYDRIDE CHEMISTRY

Metal Hydrides Incorporated

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Chemical Week — March 26, 1960

Coal Fights for Controls

The coal and petroleum industries are in a toe-to-toe brawl in Washington this week. For the chemical industry, the outcome could mean significant shifts in relative fuel and raw-material costs; some second thoughts on plant site selection; and a spur to the long-predicted switch back to coal as the prime source of basic chemicals.

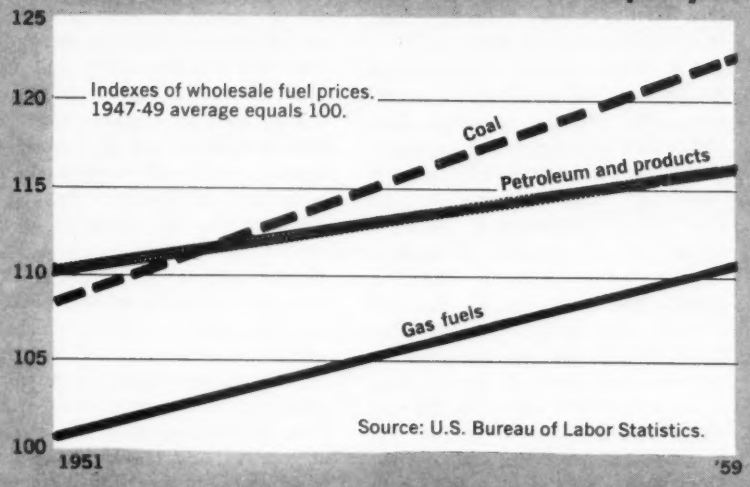
The fracas stems from resolutions introduced last summer by coal-state lawmakers in the Senate and House. The bills, calling for a Joint Congressional Committee on a National Fuels Policy, drew little attention and almost reached the voting stage before oil and natural gas advocates interceded. Now the battle in Congress has resumed.

The bills' opponents claim that such legislation would lead to government end-use control of natural resources. Low-priced natural gas — ordinarily available during off-peak demand periods—would be cut off from industrial consumers, according to gas industry leaders. All other gas consumers would wind up paying more for gas, they state.

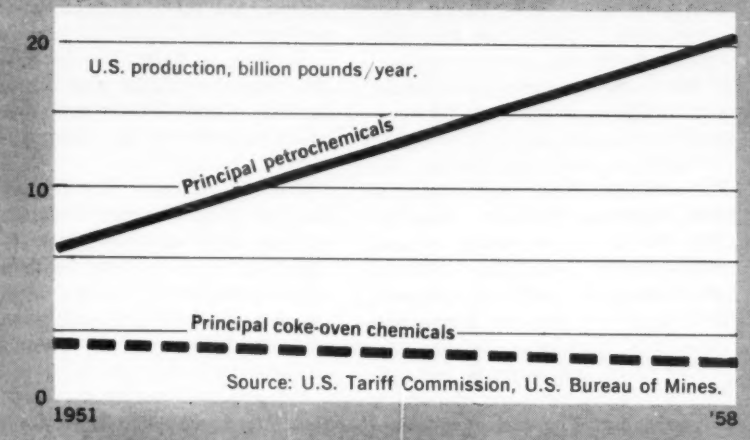
Call for Control: The coal industry—whose share of the total energy market has long been slipping—maintains that a national fuels policy is essential to efficient use of this country's limited resources. The absence of such a policy, the coal interests argue, has resulted in "uneconomic exploitation . . . wasteful competition . . . and unbalanced development" of our fuel resources. To correct this, the bills call for the proposed joint committee to consider "the optimal allocation of the various fuel and energy resources to their most productive economic uses."

This is the proposal that has aroused the greatest wrath of the petroleum and natural gas industries. The coal men, they say, aim to throttle healthy competition with government end-use controls. On the other

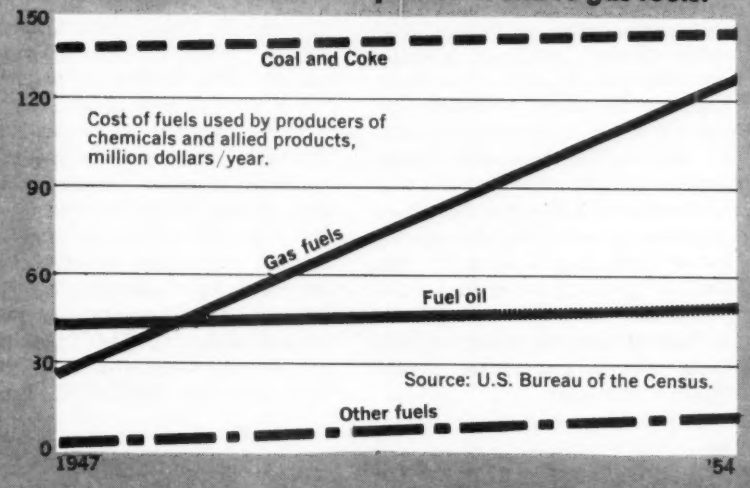
Coal's price predicament sets off drive for U.S. policy . . .



To improve coal chemicals' position vs. petrochemicals'. . .



And halt chemical companies' trend to gas fuels.



hand, the coal men declare that their main quarrel with petroleum is over "dumping" of foreign residual fuel oil at "whatever price necessary" to oust coal from industrial and electrical utility markets, and the "dumping" of excess gas supplies in industrial areas at less-than-cost prices. They disavow any effort to control the end-use of the competing fuels beyond the dumping practices.

Last week, in fact, Congressional sponsors of the coal-backed resolutions were polishing substitute bills that would delete verbiage objectionable to the petroleum industry. Joseph Moody, president of the National Coal Policy Conference (NCPC), wrote Senate Interior Committee Chairman James Murray that, although coal men see no need to change the original resolutions, they would accept the new versions, to expedite Congressional action.

But this doesn't make the oil men any happier. They believe that this is a move to "covertly" arrive at the same goal: government end-use control. Yet, petroleum industry spokesmen admit, it will be hard to convince people that a policy *per se* should not be drawn up.

Broad Front: The controversial Congressional resolutions are only part of the coal industry's campaign to better its economic position. The National Coal Assn. has reorganized and broadened its scope. And last year NCPC was set up by the coal producers, the United Mine Workers, coal-hauling railroads, and equipment makers to improve the competitive position of bituminous coal.

One of its first victories was over residual fuel imports by the major oil companies. The coal groups, supported by independent oil producers, persuaded the Administration to clamp mandatory controls on imports of all crude oil and petroleum products, including residual fuel oil for burning. And the government recently decided to cut the amount of residual oil that can be imported during the first half of this year.

The current hassle over natural gas regulation is really the latest episode in the natural gas industry's fight against government control. For years, gas producers have been trying to push through a bill to exempt them from price control by the Federal Power Commission.

In a bid for coal industry support, the gas producers offered to accept prohibitions against below-cost dumping of gas in industrial markets. But all the bills have failed, and pipeline gas sales direct to industry are continuing.

Under present circumstances, pipeline companies contend, they must sell to industry at lower prices during periods of low residential demand, to keep the pipelines filled and bring down total unit costs.

But coal-man Moody argues that home consumers pay millions of dollars each year to subsidize the gas "dumping" for industrial use. NCPC hopes to use this argument to convince home gas users — and a majority of Congress — that gas pipelines should be barred from low-priced industrial sales.

Oil and gas leaders feel they have Administration support in the recent speech of Interior Secy. Fred Seaton: "Our nation's economy is a vastly complicated and dynamic thing . . . it is not the proper role of our government to carve out or 'freeze' a portion of the total energy market for each competing fuel."

Enough to Last: The success of the coal industry's drive to cut down gas and oil competition may revolve on the question of the nation's total reserves.

Coal is plentiful, industry avers, but gas is scarce and shouldn't be dumped under industrial boilers. "Our natural gas reserves must be thought of as having a life of two or three decades as opposed to 1,000 years of coal," NCPC President George Love has stated.

Oil and gas spokesmen scoff at these statements. The U.S. has only something like a 45-year supply of coal that can be brought up at "competitive, low cost," while there are enough "predicted reserves" of natural gas and oil for "generations to come."

No one can now accurately forecast the controversy's outcome. But if a policy committee is finally established, chemical companies will have good reason to keep an eye on the legislative proposals that are evolved. They might well spark more interest in direct chemicals-from-coal projects, such as the anthracite schemes being pushed by Philadelphia and Reading Corp. and Glen Alden Corp. (*CW, March 5, p. 24*).

Portent from Japan

U.S. pharmaceutical producers trying to hold the line on "fair trade" practices can point to a current price war in Japan as an example of what might happen here if their efforts fail.

A chaotic price situation has been typical of the Japanese drug market all along, but the situation took a turn for the worse last fortnight when the Tokyo Federation of Drug Retailers defied both the government and drug manufacturers by refusing to accept any kind of "fair price" structure. Trade associations in Osaka and other major cities are expected to follow suit.

The fight—which has been raging for the past two years—came to a climax early this year when a new "cash wholesaler" opened for business in a Tokyo suburb, offering patent medicines at 50-70% of manufacturers' suggested prices, and in some cases even selling at a loss.

The problem really starts at the highly fragmented manufacturing level. With even the largest manufacturer, Takeda (a Lederle affiliate), holding only 15% of the market, producers are anxious to sell at almost any cost. There has been a growing tendency to extend all sorts of "service"—often free goods, bonuses, rebates, and payments extended even beyond the usual six-month credit—in addition to a 60- or 90-day promissory note.

The situation is made even worse by the plethora of pharmacists pouring out of Japan's 23 pharmaceutical colleges. They number about 80,000. With jobs tight and credit loose, one-man pharmacies have been sprouting like bamboo shoots in the spring.

The situation isn't much better in ethical drugs. These can be sold by doctors, some of whom are believed to be getting kickbacks of as much as 10-20% from druggists.

The result of all this is that Japanese drugs sell well below U.S. market prices. This has pinched the earnings of U.S. companies with Japanese affiliates or licensing arrangements, which are based on royalties on total sales. An executive of one U.S. affiliate tells CHEMICAL WEEK it would be impossible to capitalize its original investment at the current earnings level. And the pinch is expected to get worse.

Polyolefin Fibers Flurry

Polypropylene's low cost per pound is arousing the interest of a growing number of textile companies and synthetic fiber producers. If their optimism about prospects for these fibers is borne out, fiber applications could be a significant factor in making polypropylene a billion-pounds/year resin — like polyethylene and polyvinyl chloride, both of which attained that volume last year.

Latest company to signify its intention of producing polypropylene staple fiber: Beaunit Mills, Inc. (New York). This concern — one of the nation's leading producers of synthetic fibers—says it will install at its Elizabethton, Tenn., works equipment to produce up to 12 million lbs./year of this fiber. Onstream date: next February. Beaunit foresees promising outlets in pillow stuffing, carpets, and even clothing.

At least three other companies are already producing polypropylene staple fiber in the U.S. and Canada. Reeves Bros. (New York), Industrial Rayon (Philadelphia), and Canadian Celanese Limited (Montreal). In Italy, Montecatini is selling polymer for production of fiber, and also producing the fiber. In addition, Montecatini is one of nearly a dozen companies with polypropylene resin plants going up in the U.S.

Winning in Webbing: In one area — that of monofilament applications — polypropylene fibers already are making notable headway. With new drawing techniques said to be turning out single-strand filaments of exceptional strength, polypropylene is reportedly displacing saran monofilament from its long-established market in webbing for outdoor furniture, and has come into its own in high-strength cordage.

But the success of polypropylene in textile-type yarns — 2-15-denier filament — is likely to hinge largely on development of efficient and economic dyeing properties, which up to now have been difficult to build into these fibers. Emphasizes one textile research executive: "A low-cost fiber isn't enough if the fiber requires costlier dyeing and finishing techniques."

Current polypropylene resin prices quoted by Hercules Powder—pioneer producer of this polyolefin in the U.S. — are 42¢/lb. for general-purpose-grade, 46¢/lb. for ultraviolet-ray-stabilized resin. Some polypropylene staple fiber is reportedly priced at 70-80¢/lb., whereas nylon, Orlon and Dacron yarns are in the $1-2/lb. range. But polypropylene is said to have better chemical resistance than some other synthetic fibers; its strength and light weight are plus factors; and its price is expected to drop considerably in the future.

Deleting the Drawbacks: As to polypropylene's reputed drawbacks for fiber use, Hercules expresses confidence that both handicaps are being overcome via new technology. Dyeing of polypropylene for textile use, Hercules asserts, will "ultimately be no problem"; and the material's stability under ultraviolet radiation (as in sunlight) has been "greatly improved."

While relatively few companies have been venturing into production of polypropylene multifilament fibers, at least eight U.S. firms are now producing monofilament: Industrial Rayon, Reeves, National Plastics Products (Odenton, Md.), Polyarns, Inc. (Canandaigua, N.Y.), Southern Lus-Trus (Jacksonville, Fla.), Dawbarn Bros. (Waynesboro, Va.), General Tire and Rubber (Akron, O.), U.S. Rubber (New York), and Firestone Plastics (Pottstown, Pa.).

Dawbarn — which up to now has produced nylon, saran and polyethylene fibers — has just underscored its confidence in polypropylene monofilament by adding 60,000 sq.ft. of floor space with 20 new production lines — all for polypropylene. It is abandoning production of nylon and saran fibers, will devote its entire capacity to polyolefin products. Dawbarn says it will unveil two new polypropylene fiber products late this spring.

Aside from webbing in outdoor furniture, biggest markets anticipated by polypropylene monofilament producers are in auto seat covers, in blends for tarpaulins, and in various industrial applications.

Several polypropylene resin producers are expected to branch out into fiber production. AviSun — already producing the resin at Port Reading, N.J. — is working on a new plant near New Castle, Del., to convert the resin into both film and fiber products. Eastman Kodak — whose 20-million-lbs./year polypropylene resin plant at Longview, Tex., is expected to be onstream late this year — is evaluating fiber applications. And Dow Chemical — which is building a 10-million-lbs./year resin plant at Bay City, Mich., and a 30-million-lbs./year resin plant at Torrance, Calif. — may be able to recoup on polypropylene for some of its saran business, if polypropylene fiber is really winning the battle for outdoor furniture applications.

Moving into New Fields

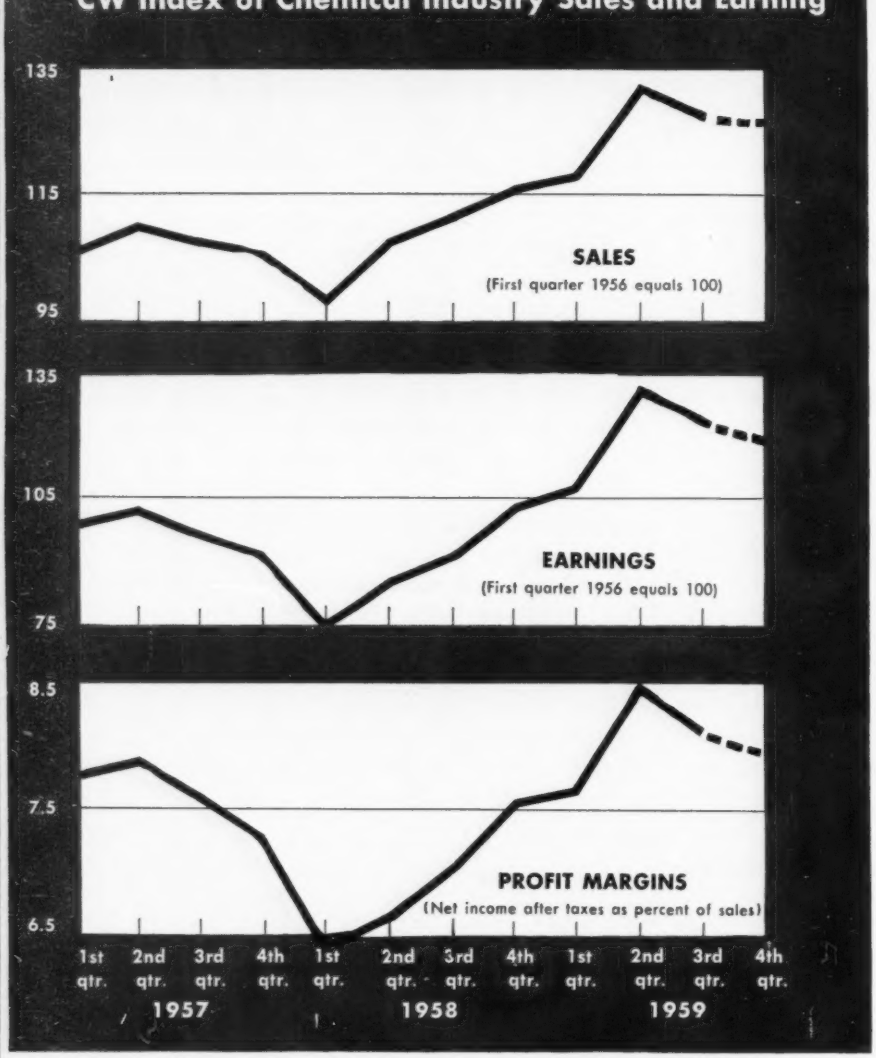
In a move to diversify operations and stabilize earning power, Calumet & Hecla — an old-line copper company — is shifting emphasis this week to the processing and fabricating of other metals.

Right now, C & H management is blueprinting two proposed projects —both still subject to board of directors approval:

- Construction of two plants at Inkster, Mich. One is a commercial-size plant to produce extruded products of aluminum, magnesium, titanium, zirconium and tantalum; the other is a semiworks plant for production of Strubing, a line of flexible, lightwall, seamless tubing products.
- Transfer of all operations of the recently acquired Flexonics Corp. to a new plant to be erected on a site near Chicago. This will mean eventual shutdown of Flexonics' six present plants — four in Illinois, one at Memphis, Tenn., one at Santa Ana, Calif. Products: flexible metal and synthetic rubber hose products.

Besides these plans, company President H. Y. Bassett told financial analysts in New York last week that C&H expects to strengthen its position this year as a major producer of copper tubing, copper-base alloys and metal extrusions.

C&H is banking on good returns from its venture with Brooks & Perkins (Detroit) to produce primary magnesium through their jointly owned subsidiary, Alabama Metallurgical Corp. (Selma, Ala.). C&H has a 70% interest in this operation, which is already in production and which ultimately will have a capacity of 12 million lbs./year (*CW, Feb. 20, p. 22*).



Fast Start in '60 After '59 Dip

Early returns on the course of business in 1960 indicate that, in this first quarter, the industry will more than recover the ground lost in fourth-quarter '59.

Chemical industry sales in January, the U.S. Commerce Dept. reported last week, were up 2.6% from the December level; and production in such key industries as steel, auto, and petroleum refining was holding steady at high levels throughout February and well into March.

Late corporate financial statements show that chemical sales and earnings dipped slightly in fourth-quarter '59 (*see charts*). This was due largely to the over-all business slowdown stemming from the 116-day steel strike. The new data fills out the picture outlined by the returns of companies that report their figures earlier (*CW, Feb. 13, p. 21, and March 12, p. 31*).

Despite the strike-induced letdown in the third and fourth quarters of '59, the year brought best-ever sales and earnings to more than 90% of all principal producers of chemicals and allied products. Due to higher (than in '58) operating rates and emphasis on cost-cutting, chemical earnings for '59 were about one-third higher than in the recession-and-recovery year of '58, and about 20% higher than the previous business peak in '57.

For makers of chemicals and allied products, the year brought an encouraging lift in profit ratios. The net income-to-sales ratio—which slumped to an average of 6.95% in '58—rebounded to 8.05% in '59.

Among late-reporting CPI companies, two of the highest relative gains in net earnings were recorded by International Nickel and Pittsburgh Coke & Chemical (*table, left*). This, in part, at least, reflects the severe losses metal companies suffered during the 1957-58 recession. Another sharp rise in net income was reported by Commercial Solvents; CSC's gain stems partly from improvement in sales-volume and operating ratios, partly from policies instituted when the new management took over last April.

Latest companies reporting '59 results	*1959 Sales**	*Change from '58*	*1959 Earnings**	*Change from '58*
Abbott Laboratories	122.6	Up 5.1%	13.0	Up 0.9%
American Cyanamid	583.6	Up 11.1%	52.3	Up 19.2%
Carwin Co.	3.0	Up 30.6%	0.1	Up 90.6%
Celanese Corp.	265.2	Up 18.6%	22.6	Up 35.7%
Commercial Solvents	70.4	Up 8.7%	2.9	Up 101.0%
Cowles Chemical	8.6	Up 12.3%	0.3	Up 79.1%
Food Mach. and Chemical	342.9	Up 6.1%	20.6	Up 24.4%
Freeport Sulphur	53.2	Down 3.8%	14.5	Up 10.6%
International Nickel	457.8	Up 42.1%	85.2	Up 114.7%
Lever Brothers	409.6	Up 7.1%	15.2	Up 50.5%
Metal Hydrides	5.9	Up 81.1%	0.3	Up 48.0%
Pittsburgh Coke & Chemical	70.0	Up 53.9%	2.7	Up 110.3%
Pittsburgh Plate Glass	606.9	Up 18.2%	44.1	Up 37.5%
Sun Chemical	54.8	Up 10.2%	1.3	Up 23.1%

* Dollar figures in millions

EXPANSION

Bond, Offset Paper: Kimberly-Clark Corp. will add a new paper machine at its Moraine paper mill in West Carrollton, O. Moraine is a division of American Envelope Co., acquired last year by K-C. The expansion will triple production.

•

Aluminum Ingot: Aluminum Co. of Canada (Montreal) has slated $1.6 million for furnaces and other equipment at its Kitimat, B.C., facility. Expected to be in operation by the end of this year, the new equipment will enable the plant to produce about 36,000 tons/year of extrusion ingot. Kitimat's primary aluminum capacity: 186,000 tons/year.

•

Rubber Hose: American Biltrite Rubber Co. (Chelsea, Mass.) will build a $3-million plant in Hohenwald, Tenn., for its Boston Woven Hose & Rubber Division. Also reported: acquisition of virtually all the stock and outstanding obligations of National Shoe Products Co. (Framingham, Mass). Expansion of its lines and warehouse is planned.

COMPANIES

Anken Chemical and Film Corp. (Newton, N.J.) has contracted to buy the photocopy business of Sperry Rand Corp.'s Remington Rand Division (New York) for more than $3 million. Not included in the transaction: Remington Rand's microfilm sales and contract service operations. The acquisition includes one plant at Newton, another at Williamstown, Mass.

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Cutter Laboratories (Berkeley, Calif.) will ask shareholders at a special meeting March 31 to approve reincorporation under Delaware laws and to grant voting rights to Class A common shares.

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Bunker Hill Co. (San Francisco) is entering the zinc oxide market on the West Coast, making it the only primary producer in the Pacific area. The company has manufactured since 1948.

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Reichhold Chemicals, Inc. (White Plains, N.Y.), has completed acquisition of Alsynite Co. of America. Alsynite will operate as a division of Reichhold.

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Adams-Millis Corp. (High Point, N.C.) is expected to merge late this month with its partly owned MAC Panel Co., which by summer will begin production of magnetic tapes for instrumentation, geophysical and sound recording.

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North American Car Corp. (Chicago), which acquired Alexander Chemical Corp. in 1958, has divided the company into a Chemical Division and a Terminal Services Division. The chemical unit is looking into "several interesting additions to its basic chemical business," seeks to increase its earnings.

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Thiokol Chemical Corp. has been awarded a $1.5-million contract by the Army to produce Falcon rocket motors at Thiokol's Redstone Division plant (Huntsville, Ala.).

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Brush Beryllium Corp. (Cleveland) directors have voted to recommend a two-for-one common stock split and an increase of authorized shares from 1.2 million to 2.5 million. The proposal will be submitted to stockholders April 11.

FOREIGN

Cement/Poland: F. L. Smith, Danish exporter of cement manufacturing plants, has sold a $15-million cement factory to the Polish government. This 4,000-tons/day facility—second to be supplied to Poland by F. L. Smith—will be located in southern Poland. The first plant recently began production in eastern Poland near the Russian border.

•

Subsidiaries/Switzerland, Panama: Dow Corning Corp. (Midland, Mich.) has formed two overseas distributor-subsidiaries—Dow Corning AG. (Basel, Switzerland) and Dow Corning International S.A. (Panama). No manufacturing operations are planned.

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Paper Sizing/Netherlands: Heyden Newport International Corp. has purchased the capital stock of N. V. Transicol, a Netherlands corporation that manufactures paper size at Rotterdam and Geertruidenberg. Transicol is a major consumer of rosin in Europe. Heyden Newport is a leading rosin producer in the U.S. and Mexico.

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Petrochemicals/Panama: Ultramar, a British-owned company, has offered to acquire Panama Refining and Petrochemical. Owners of more than 90% of Panama capital have announced acceptance; Ultramar stockholder acceptance will be sought March 28. The British firm also plans to expand production at the Los Angeles refinery of Panama's subsidiary, Golden Eagle, from 9,000 bbls./day to 30,000. Meanwhile, Ultramar is reported to be negotiating with unidentified oil companies to form a partnership to construct a refinery in Panama. Golden Eagle has the site and concession.

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Loans/France: Nine leading French chemical companies, along with the Chemical Industry Trade Assn. and three banks, are setting up a financial group to float loans for development of the French chemical industry. Participating firms: Pechiney, Saint-Gobain, Rhone-Poulenc, Ugine, Kuhlmann, L'Air Liquide, Nobel-Bozel, Produits Azotes, and Progil; and three banks: Lazard Freres, Credit Commercial de France, and Credit Lyonnais.

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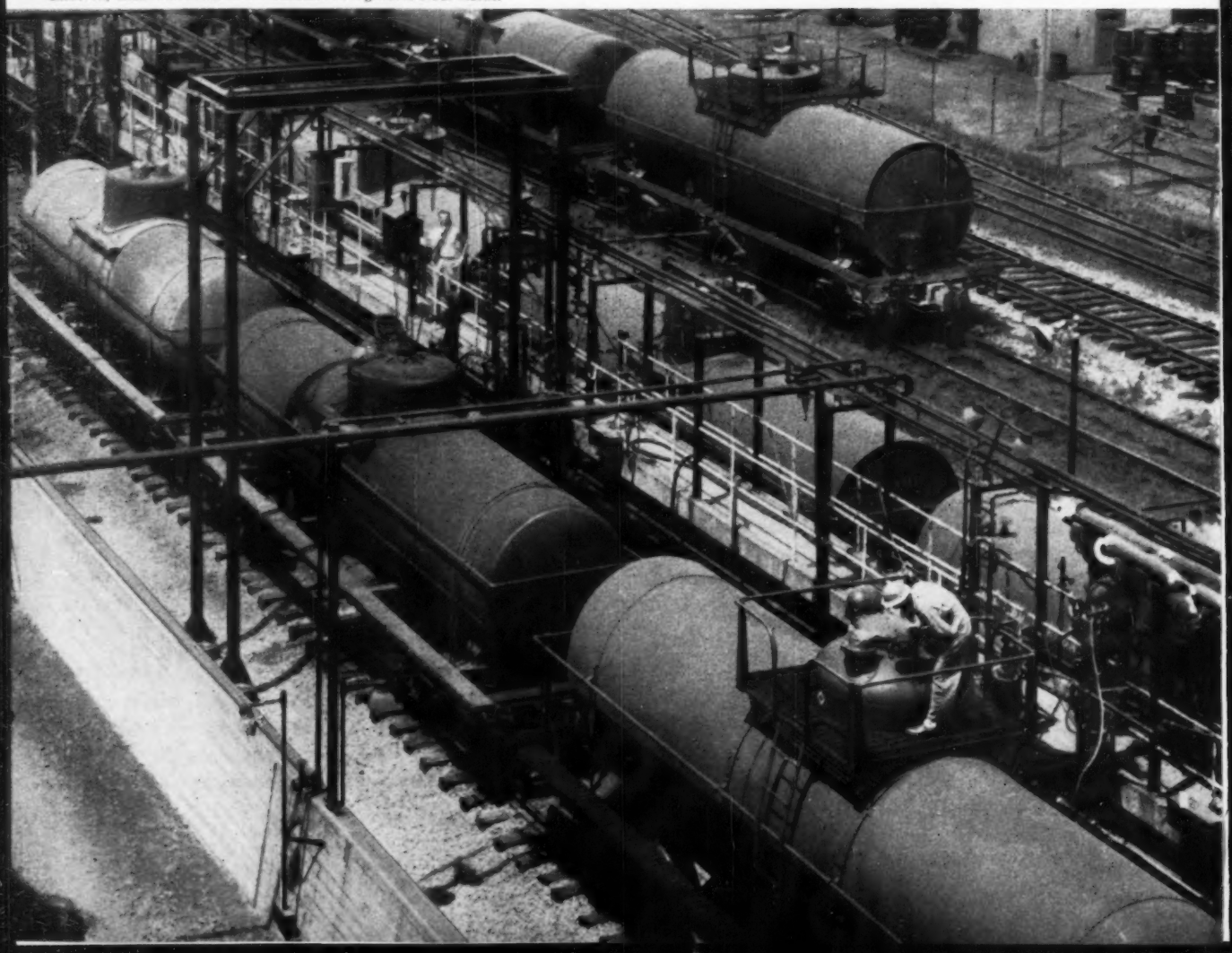

Washington
Newsletter

CHEMICAL WEEK
March 26, 1960

The squeeze of tight money for capital plant expansion is easing. It's too early to see how far the trend will go but government economists view the outlook as considerably brighter than a month ago.

Interest rates are falling, bond prices are rising, and the Federal Reserve is adopting a less restrictive attitude toward the supply of credit.

The forecast at the beginning of the year was for higher interest costs and declining credit through '60. Now these predictions are being strongly tempered. Industrial construction, public works and housing will probably not be stymied for lack of credit.

The change is due primarily to diminished fears of inflation on the part of federal monetary authorities, and to smaller demand for business loans than had been expected. This does not mean a recession is in the offing, federal reserve economists say. But it does mean the foot can be lifted off the monetary brakes without starting another inflationary cycle.

•

An important bill aimed at blocking patent rights on research paid for by the government has emerged from a months-long study by the Senate Patents Subcommittee. It would give the National Science Foundation a say in whether a firm should be allowed to keep patents stemming from such research.

Here's the way it would work: if Defense or any other agency wants to give a company patent rights in a contract that is primarily for basic research, it must submit the contract to NSF and the Justice Dept. for review. Those agencies would then express a formal opinion. The burden of justifying the awarding of patent rights then would fall on the agency letting the contract.

The Senate committee is concerned about private companies getting a headstart in new markets via research financed by the taxpayer. The committee feels the results of such research should be published widely and quickly, not kept within any one company.

Chairman Joseph C. O'Mahoney (D., Wyo.) scores the NSF for "surprising indifference" in its job of seeing that the fruits of research are widely distributed. He expects to hold hearings this session but no action is possible before next year.

•

More, not less, research by the Atomic Energy Commission is scheduled for the next 10 years. The Manufacturing Chemists' Assn., Chamber of Commerce and NAM have protested that AEC is already doing too much R & D that should be performed commercially.

The step-up is made clear in a new, 300-page AEC report giving a rundown of its 20 laboratories (staffed with 42,000 employees),

which already perform about $600 million worth of research annually. The commission insists its labs should remain "paramount in pioneering work as the inventors and developers of new concepts and as the talented source of varied capabilities for tackling complex and unusual assignments" in scientific research.

The report is strongly endorsed by Sen. Clinton P. Anderson (D., N.M.), Chairman of the Joint Committee on Atomic Energy. Copies have been sent to industry, along with a request for comments on types of research that should be performed by national laboratories.

Extent of the chemical research involved is shown in a random sampling of the bigger labs. Argonne Lab at Lemont, Ill., for instance, will spend $42 million this year, much in the chemical area. Oak Ridge has a $56-million budget, much of it in metallurgy and chemical process development for reactor fuels.

•

Chemical industries in Cuba may benefit from what Washington considers a lessening of tensions between Castro and the U.S. Cuban officials are entering into a new round of talks, for instance, with Freeport Sulphur Co. over its $75-million nickel plant. Two weeks ago Freeport announced it was closing out. Last week it was reportedly ready to reconsider as a result of overtures from Castro. Final result depends on whether the dictator works out a compromise he offered last fall to substitute a 5% marketing fee for a prohibitive 25% export tax.

The State Dept. has received indications that Castro and some of his advisors are beginning to feel they have gone too far in their anti-Yankee campaign. One reason: Eisenhower received assurances on his Latin-American swing that those countries endorse the U.S.'s "wait and see" policy, and feel Castro has let things get out of hand.

Meanwhile the U.S. is exerting a subtle bit of pressure on Castro: an Administration request for stand-by authority from Congress to cut Cuban sugar subsidies.

•

U.S. industry is eyeing Puerto Rico as a tax haven for a banking operation on overseas investments, like Panama or Switzerland. As a result of a recent ruling by the local government, the island becomes the only U.S.-flag territory that can offer a tax haven.

A U.S. firm with overseas investments can return money to an office in Puerto Rico and dispense it elsewhere abroad without paying the U.S. income tax. Not until the money returns as profits to the U.S. will it be taxed. Puerto Rico can offer this enticement because of its unique independence (among American possessions) from U.S. tax laws.

Puerto Rico has these advantages over other tax havens: protection of the U.S. flag, stable government, no threat of expropriation, use of the dollar, similar corporation laws, good communications and airplane connections.

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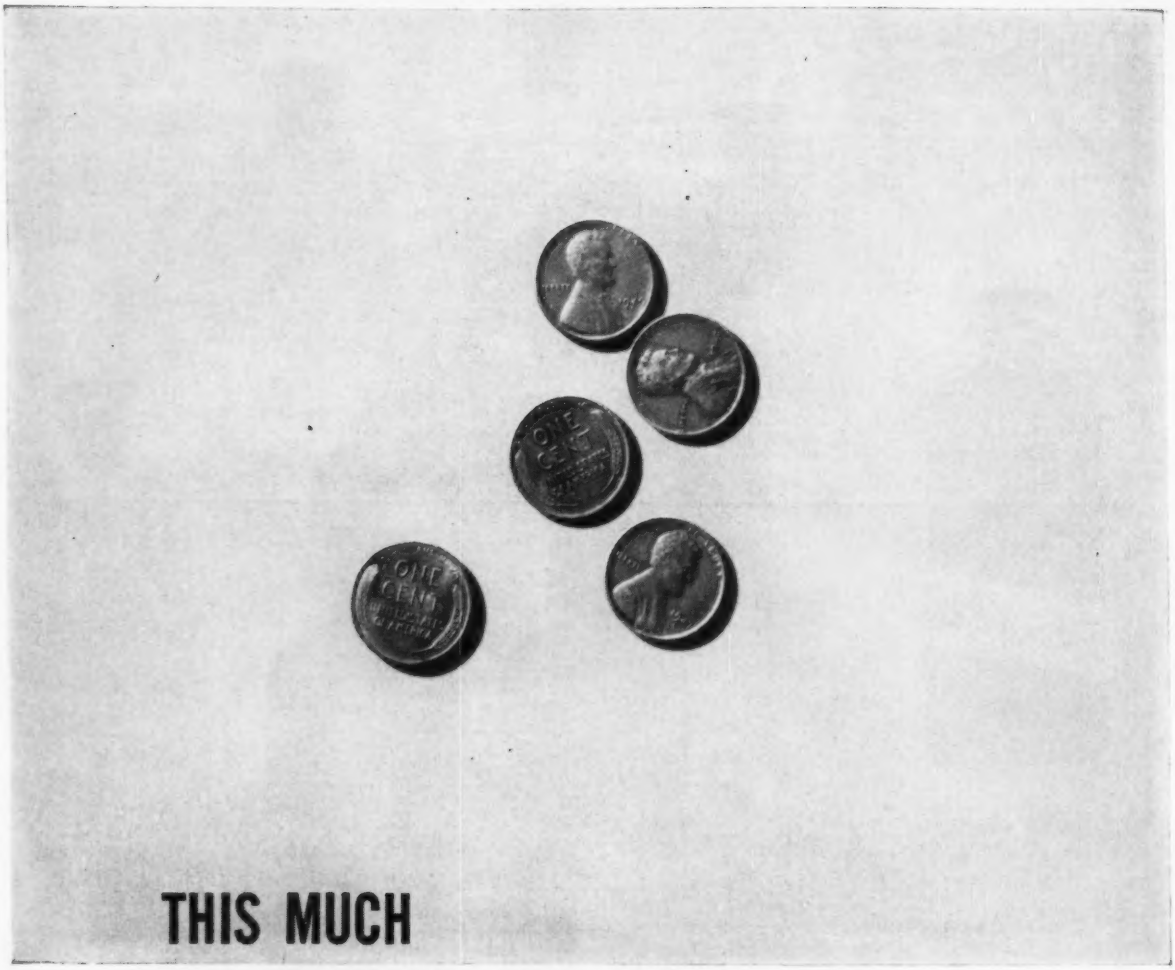

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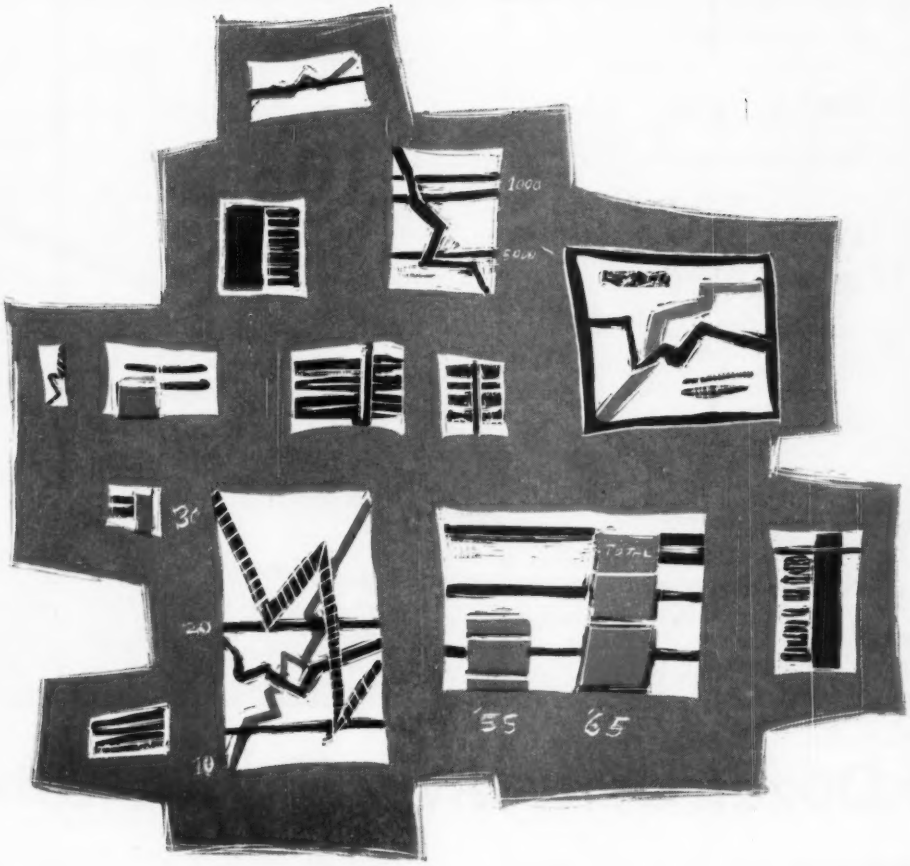
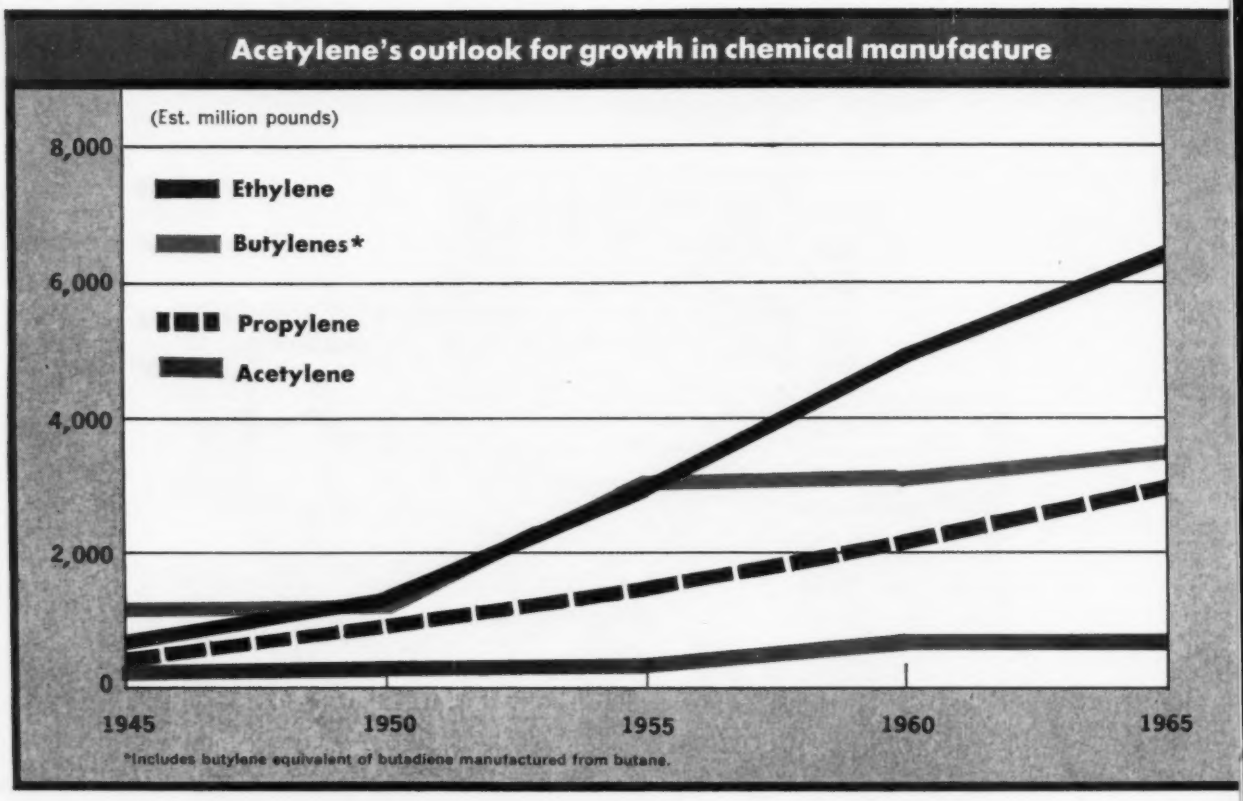


ACETYLENE

What's in store for acetylene as a major chemical raw material? Increasing competition from ethylene, propylene and other olefins, the startling increase in methods of converting hydrocarbons into acetylene, the bugaboo of rising manufacturing costs are factors that cloud acetylene's future. Here are the market prospects through '65 for acetylene derivatives; the future of calcium carbide vs. hydrocarbon conversion processes for acetylene production; plant expansions under way or planned — in short, the complete acetylene story.



Half-Dozen Derivatives Shape Acetylene's

In the next five years, there will be some increases in U.S. acetylene output and demand, progress in acetylene-production technology (particularly in hydrocarbon-acetylene processes), and growth in the proportion of acetylene required for chemical synthesis vs. metal welding, cutting, and myriad miscellaneous nonchemical outlets.

But in the half-decade ahead, acetylene as a chemical raw material will show no explosive growth, win no accolades as a big-profit commodity. Prospects are not brilliant:

(1) Increasing inroads into once-assured acetylene preserves by generally less-expensive hydrocarbons. Result: an anomaly. While products made from acetylene are slated for substantial production increases, no surge in acetylene use will result.

(2) Producers' difficulties in cutting manufacturing costs to bring the price of chemical acetylene down to levels competitive with those of other olefinic raw materials. Coupled with this problem is the growing intra-industry conflict concerning the relative merits of newer acetylene processes based on natural gas and oil vs. the classic calcium carbide route.

On the whole, acetylene's prospects—through '65, at least—contrast with the roseate outlook for ethylene and propylene (*CW, April 25, May 9, Nov. 14, '59*).

Acetylene production is now running at a rate slightly above 900 million lbs./year. (This does not include quantities produced and consumed by railroad shops, shipyards, and small establishments maintaining portable generators, in keeping with Bureau of Census classification.) Of the total this year, approximately 85%, close to 760 million lbs., will be used in manufacture of vinyl chloride, neoprene, trichloroethylene and perchloroethylene, acrylonitrile, vinyl acetate, and other chemical compounds.

The remainder will go into metal welding, cutting and scarfing, illumination (once acetylene's prime outlet), direct government purchases, etc. Ten years ago, these nonchemical uses were taking more than 35% of acetylene consumed in the U.S.; next year, it may drop to 15%.

Acetylene's future—its demand, capacity and availability—therefore will hinge upon the unfolding fortunes of the products made from it.

Vinyl Chloride

When final '59 government figures are released later this year, they will show that U.S. production of vinyls (as a class) for the first time exceeded the 1-billion-lbs. mark; the total may well be close to 1.1 billion.

Total U.S. vinyl production in '60 will almost surely

U.S. output* of acetylene derivatives

Derivatives	est. million pounds 1955*	1956	1957	1958	1960	1965
Vinyl chloride	529	597	627	691	925	1,100
Neoprene	208	223	248	219	250	275
Trichloroethylene	316	346	338	295	370	450
Acrylonitrile	118	141	174	180	250	400
Vinyl acetate	134	164	171	190	230	300
Perchloroethylene	178	186	197	187	225	285

*Chemical Week estimates based on government and trade data.

How much acetylene they require

Derivative	Conversion Factor*	Est. million pounds of acetylene 1955	1956	1957	1958	1960	1965
Vinyl chloride	0.45	130	150	165	185	255	320
Neoprene	0.7	150	156	175	150	175	195
Trichloroethylene and perchloroethylene	0.245	80	85	83	75	90	110
Acrylonitrile	0.6	37	50	68	75	120	175
Vinyl acetate	0.3	40	40	42	45	55	80
Other (acrylates, methyl styrene, Reppe, etc.)	—	13	19	27	40	65	115
Total chemical use		450	500	560	570	760	995

*Pound of acetylene per pound of product.

Market Growth Prospects Through '65

reach 1.2 billion lbs., fulfilling a prediction (*CW, Nov. 16, '57, p. 71*). This would represent a whopping 800-million-lbs. increase over the near-400-million-lbs. production reported by the U.S. Tariff Commission in '54.

But surging production is only one feature of the vinyls picture. Another: fantastic growth of U.S. capacity to produce vinyl chloride monomer and polymer.

Within the short span of four years, more than 500 million lbs. of monomer capacity have been added, pushing today's total above 1.4 billion lbs.

PVC Soaring: The climb in polyvinyl chloride capacity has been even more arresting. PVC (designating polymers and copolymers containing more than 50% vinyl chloride) accounts for more than 75% of total vinyl production. U.S. production capability for PVC will soon reach nearly 1.4 billion lbs./year compared with over 800 million lbs. two or three years ago.*

Latest to reveal PVC expansion plans are B. F. Goodrich Chemical (building an estimated 20-million-lbs./year plant at Watson, Calif.) and Borden Chemical, which will double its present capacity (40 million lbs./year at Leominster, Mass.) with a new plant at Illiopolis, Ill.

In addition, most of the relatively small "packaged" PVC plants (4-15 million lbs./year), designed or constructed by Scientific Design (New York) over the past few years, have been—or are being—expanded. Among them are plants of: Thompson Chemical (to a trade-speculated 75 million lbs./year from an original 10-million-lbs./year plant); The Pantasote Co., Passaic, N.J. (to 45 million lbs./year); Cary Chemical, Flemington, N.J. (to 35 million lbs./year from 12 million).

Scientific Design (which promotes low-budget, package PVC plants), Blaw-Knox, Pfaudler, Lummus and other construction companies have done much to hike U.S. capacity.

Paradoxically, some of these "outside"-engineered plants are being independently expanded by PVC producers, who can boost capacity simply by adding units to their basic installation. In this and other ways, many formerly small PVC buyers have progressed toward major status as producers.

The transition for seven such firms† started in the early '50s when as a group they concluded a deal with Allied Chemical's Solvay Process Division (then outside the

* Capacity data cited in this report should be regarded as indicating order of magnitude. Capacities, especially of PVC plants, vary widely, depending on resin type, quality and number of formulations produced.

† The so-called Solvay group—Borden Chemical, Cary Chemical, Great American Plastics, Insular Chemical, The Pantasote Co. (Eleanora Chemical), Presto Plastics, Thompson Chemical.

vinyls field), whereby the latter agreed to produce monomer for assured outlets. One measure of the deal's success: since it got into the business, Solvay Process has more than tripled vinyl chloride monomer production (now estimated at 150 million lbs./year) to keep pace with demand.

And the industry won't be surprised if Allied soon builds another vinyl chloride plant to satisfy upcoming increased demand. Likely capacity: in excess of 100 million lbs./year. Likely location: Moundsville, W. Va.

Monomer Routes: Slightly more than half the monomer made in the U.S. stems from acetylene. This ratio has changed little over the past five years, and will not change much in the near future.

Choice of production method depends on availability, purity and price of raw materials (acetylene, ethylene, hydrogen chloride, chlorine and ethylene dichloride). Where an ethylene route is selected, potentially salable by-product HCl becomes an important factor. Synthesis of the monomer from acetylene results in no by-products.

A look at some recent expansions points up reasons behind the selection of different raw-material routes to vinyl chloride.

American Chemical, jointly owned by Stauffer Chemical and Richfield Oil, has just started production of vinyl chloride monomer in 25-million-lbs./year (estimated) plant at Watson, Calif. American Chemical chlorinates a C_2 (ethylene and ethane) stream from the Richfield refinery to make ethylene dichloride and other chlorinated products.

The ethylene dichloride is cracked to produce vinyl chloride monomer and HCl. The hydrogen chloride reacts with ethylene to yield ethyl chloride for production of tetraethyl lead on the West Coast. Thus the integrated operation provides outlets for Richfield's C_2 stream, and for Stauffer's chlorine.

American Chemical, which has dropped plans for a PVC plant at Watson, reportedly will supply monomer for Goodrich Chemical's upcoming installation at that location (*CW Market Newsletter, Jan. 30*).

Cumberland Chemical (60% owned by Air Reduction and 40% by Mastic Tile Division of Ruberoid) has another approach. At Calvert City, Ky., it is building monomer and polymer production facilities. The monomer production will be based on acetylene and HCl, thus affording Air Reduction (a major acetylene-from-carbide producer) an outlet for upgrading part of its acetylene. Most of the PVC to be produced will be consumed by Mastic Tile.

Solvay Process's choice apparently was based on its position in HCl, a by-product of its chloromethane operation at Moundsville. Acetylene, Solvay's other principal monomer raw material, is bought from an adjacent Union Carbide plant.

Like Solvay's plant, Diamond Alkali's 50-million-lbs./-year monomer unit (Deer Park, Tex.) is based on available by-product. Its HCl comes from chlorinated-solvent operations, and the necessary acetylene from Rohm & Haas' nearby plant. The acetylene, however, is derived from natural gas.

Ethyl Corp. will build a monomer plant at Houston, Tex. The firm entered the vinyl chloride arena in '58 via the ethylene dichloride cracking process. It uses the by-product HCl to make ethyl chloride for use in its tetraethyl lead fluids. Capacity of Ethyl's original monomer plant at Baton Rouge, La., was estimated at 60 million lbs./year, but CHEMICAL WEEK learns that the operation is capable of producing as much as 150 million lbs./year.

There's no indication how large Ethyl's new Houston unit will be, but 60 million lbs./year is a not unlikely starting capacity.

Thus, while some companies rely on ethylene, others on acetylene, for monomer production, economic factors occasionally dictate the use of both starting materials. Goodrich Chemical is the latest to adopt this "in-balance" type of operation, which is used by Monsanto and Carbide.

Goodrich, one of the largest and oldest monomer and polymer producers, until last year based its vinyls manufacture exclusively on acetylene. In mid-'59, it started a unit at Calvert City, Ky., to produce vinyl monomer by cracking ethylene dichloride. Resulting by-product HCl is combined with acetylene in the older plant to form more monomer.

In '60, vinyl chloride output in the U.S. will call for 255 million lbs. of acetylene, compared with 185 million lbs. needed in '58. By '65, the acetylene requirement for U.S. vinyl chloride should reach 320 million lbs./year. Output of vinyl chloride monomer—including that derived from ethylene dichloride—should be running at a rate of 1.1 billion lbs./year.

Polyvinyl Chloride

The only major outlet for vinyl chloride monomer is PVC resin, although some is used as a copolymer with vinyl acetate.

For all practical purposes, 1-lb. of monomer is required for each pound of PVC, although there is a slight loss of monomer in polymerization. Thus, mushrooming polymer capacity will be reflected in monomer needs (*see table, p. 49*) and explains, in part, the hectic scramble to put up additional units despite today's excess capacity.

PVC Outlook: Pegging the prospects for polyvinyl chloride resin consumption usually means depending, to some degree, on the Tariff Commission's breakdown of sales by end-use. These data are compiled from monthly figures reported by individual resin producers. But there are modifying factors to consider. For one, producers, in many instances, are not quite certain of the ultimate use made of the resin they sell. Tariff Commission tables, too, are incomplete; they do not include a breakdown of some captively consumed resin, or of imported material.

Regardless of how they have been reached, all PVC market-pattern predictions agree: PVC use will continue to grow in molding and extrusion, calendering of films and sheeting, textile and paper coating, and a miscellaneous group covering dispersions, foams, adhesives, and other outlets not specifically classified.

Largest PVC outlet is molding and extrusion, which can be subdivided into a number of uses headed by primary insulation and jacketing of wire and cable.

This year molders and extruders will consume about 315 million lbs. of vinyl chloride polymers and copolymers.

Major U.S. vinyl chloride resin producers

1960-61 capacities; est. million pounds/year

Producer	Monomer Plant	Capacity	Polymer Plant	Capacity
Union Carbide	So. Charleston, W. Va. Texas City, Tex.	260	So. Charleston, W. Va. Texas City, Tex.	260
Goodrich Chemical	Niagara Falls, N. Y. Louisville, Ky. Calvert City, Ky.	240	Niagara Falls, N. Y. Louisville, Ky. Avon Lake, O. Watson, Calif.	260
Dow	Freeport, Tex. Midland, Mich. Plaquemine, La.	200	Freeport, Tex. Midland, Mich. —	40
Allied Chemical	Moundsville, W. Va.	150	—	—
Monsanto	Texas City, Tex.	130	Springfield, Mass.	125
Ethyl Corp.	Baton Rouge, La. Houston, Tex.	150 60	— —	— —
U.S. Rubber	Painesville, O.	70	Painesville, O.	65
Cumberland	Calvert City, Ky.	60	Calvert City, Ky.	55
Diamond Alkali	Deer Park, Tex.	50	Deer Park, Tex.	60
Goodyear	Niagara Falls, N. Y.	45	Niagara Falls, N. Y.	40
General Tire	Ashtabula, O.	30	Ashtabula, O.	45
American Chemical	Watson, Calif.	25	—	—
Firestone Tire	—	—	Pottstown, Pa.	80
Borden Chemical	—	—	Leominster, Mass. Illiopolis, Ill.	40 40
Thompson Chemical	—	—	Hebronville, Mass.	75
The Pantasote Co.	—	—	Passaic, N. J.	45
Escambia Chemical	—	—	Pensacola, Fla.	40
Cary Chemical	—	—	Flemington, N. J.	35
Atlantic Tubing and Rubber	—	—	Cranston, R. I.	25
Great American Plastics	—	—	Leominster, Mass.	15
Presto Plastics	—	—	Brooklyn, N. Y.	15
Insular Chemical	—	—	Hicksville, N. Y.	10
Keysor Chemical	—	—	Los Angeles, Calif.	6
Minnesota Mining	—	—	St. Paul, Minn.	5
	Totals	1,470		1,381

Industry expectations for the next half-decade range widely. Good estimate: by '65, 510 million lbs./year of PVC resins will be sold to molders and extruders.

A few years ago, half the resins used in this category went for wire and cable coating, with building wire taking the major portion. While the proportion is decreasing, volume of consumption is rapidly rising. This segment could account for 175 million lbs./year of PVC demand in '65, compared with an estimated 125 million lbs./year in '60, and less than 40 million lbs./year about a decade ago.

Just about all new house wiring is now vinyl-coated—a market gained largely at the expense of rubber—and future growth will reflect new housing starts.

Profile extrusions (for automobiles, window channeling, refrigerator gasketing, tubing, and similar products), are also increasing rapidly. Most market researchers envision about 85 million lbs. of vinyl demand by the mid-'60s, a more than fourfold increase since '55 (20 million lbs.).

It's difficult to forecast the growth of vinyl in phonograph records. The problem is complicated by competition of other resins (e.g., polystyrene) and the phenomenal growth of tape-recorders for home use—a cause of much concern to the record industry. Guesstimates for '65 range from a pessimistic 50 million lbs. to a probably over-optimistic 130 million lbs. Good bet: 80 million lbs. in '65. Records will take about 45 million lbs. in '60.

While growth of the other important molding and extrusion outlets won't be as spectacular, all are slated for satisfying volume increases.

Flooring Up: Preliminary estimates of vinyl chloride consumption indicate that flooring, along with molding and extrusion, rates honors for volume growth in '59. Vinyl resins are used in three types: vinyl asbestos tile; flexible all-vinyl tile; and vinyl-coated continuous floor covering that's successfully bucking older-line linoleum. By '65, floor covering will consume nearly 250 million lbs. of resin. Estimate for this year: 160 million lbs.

Vinyl coating of metals—via calendered sheet or film, spread or dip coating—is still a comparatively small outlet, but some market men peg this outlet as "potentially fabulous." The vinyl protects metal surfaces from marring or corrosion, is also used for decoration or for noise reduction. One present application: vinyl-clad housings for air conditioners, heaters, other appliances.

Steady Price: Since much of the vinyl monomer produced in the U.S. is captively consumed, price has generally not been a significant market factor.

Solvay Process, Ethyl Corp. and American Chemical are exclusively monomer merchants, while Union Carbide only recently began selling some output. Monsanto, Cumberland and Dow are other producers that sell a portion of production.

Thus, vinyl monomer prices, usually tied to contract escalation clauses, have varied little from the 10-11¢/lb. base price established five or six years ago. Most marketers now quote tags ranging from 11.6 to 11.8¢/lb., depending on point of manufacture.

On the other hand, polymer prices have been consistently beaten down over the past several years by shrewd intra-industry maneuvers, low-cost imports, and, frequently, by desire of producers to broaden markets. The steady downtrend has lopped 7½¢/lb. off average general purpose PVC prices since '55; it's now 23½¢.

Increasing domestic production, expanding capacity, and keener competition from other resins, may well pressure PVC prices to lower levels. But while most trade observers concede that further reductions may be forthcoming, they are convinced that the price floor allowing manufacturers some measure of profit has just about been reached.

Neoprene

Neoprene production soared 28% in the year just ending. The '59 total was about 279 million lbs.—a record that may not be topped for at least five years (*see table p. 47*). U.S. production this year is not expected to exceed 250 million lbs., and may drop to as low as 225 million lbs.

Actually, neoprene's outlook is not as dim as these figures might indicate. The anticipated reduction in U.S. production will, for the most part, reflect only decreasing exports as European capacity expands.

Du Pont, of course, is the only commercial producer of neoprene. In the next few weeks, its first non-U.S. neoprene plant will be operating at Londonderry, North Ireland. The unit will have an initial capacity of 50 million lbs./year, and will sell to overseas customers now buying U.S.-made material. In addition, Farbenfabriken Bayer, under license from Du Pont, will soon have a 30-million-lbs./year (estimated) neoprene unit.

If local demand increases as anticipated, Du Pont will likely build another foreign plant (perhaps on the Continent), and ultimately restrict all the Montague and Louisville plant's output to the U.S. and South America.

Domestic consumption has had a remarkably steady growth; the only downturn occurred in recession-ridden '58. U.S. use in '55 totaled nearly 166 million lbs.; in '56, about 168 million lbs.; in '57, 170 million lbs.; in '58, not quite 158 million lbs.

Consumption in '59, however, was an eye-opener—nearly 190 million lbs. A 7-million-lbs. increase is expected this year, with a subsequent 2-3% annual increase. Estimated '65 consumption: 220 million lbs.

Perhaps half the neoprene output winds up in a broad "mechanical goods" category (*see table, p. 52*). This includes hosing, belting, automotive products, molded parts, and a host of other items. Some 25% goes to wire and cable insulation, and the remainder to a long and still-growing list of applications, including coated fabrics, tires, sponge and foam, etc.

Neoprene has moved up the market ladder because of its generally good physical properties and its ability to withstand oil and grease, sunlight, ozone, heat and flame. Good ozone resistance, for example, has recently opened up a new market for neoprene as a partial substitute for natural rubber in tire whitewalls.

Competition has sprung up for many of neoprene's outlets. Polyvinyl chloride and polyethylene have moved in strong in wire and cable insulation, butyrate in gaso-

line and fuel hosing. Some recently introduced types of nitrile rubber have weathering characteristics equal to neoprene's, plus improved color stability.

Chlorosulfonated polyethylene rates about the same as neoprene in oil resistance, but is superior in ozone resistance and can be colored. Neoprene is black, and attempts to add color have not been fully successful. This admittedly has limited the product's use in some specialty rubber markets.

A relatively high price may also stunt neoprene market growth. For instance, the material is said to improve performance of asphalt. But neoprene-modified asphalt, though it contains only about 3% neoprene, is still hobbled by high cost.

Neoprene prices range from 39¢ to 45¢/lb., depending on type and quantity, but its f.o.b. base price (41¢) compares unfavorably with tabs on S-type and butyl rubbers, which have remained consistently in the 21-24¢ range.

Neoprene has the distinction of being the only major product based entirely on acetylene. Until '57, neoprene was the largest single consumer of acetylene, taking, in that year, some 175 million lbs. vs. vinyl chloride's 165-million-lbs. acetylene requirement. In '59, neoprene accounted for 195 million lbs. of acetylene, while this year the figure will drop again to about 175 million.

Chlorinated Solvents

Trichloroethylene is one of the hottest topics of chemical market conversation. The talk centers mainly on the growing surge of low-cost trichloroethylene and tetrachloroethane imports and their inevitable impact on U.S. production. And acetylene makers have a big stake in the outcome.

The figures aren't official yet, but indications are strong that trichlor imports last year totaled nearly 52 million lbs. Bulk of the material came from Italy and the United Kingdom, which accounted for 18.4 million and 17.4 million lbs., respectively. Imports in '59 were approximately 17 million lbs. more than in the previous year, and not quite 30 million lbs. more than those of '56. In '57, a little more than 41 million lbs. came into the country.

Importers of trichlor are paying shipload-quantity prices well below today's U.S. tank-car tag of 12¢/lb. (works, freight equalized), even after absorbing ocean-going charges and ad valorem duty.

The imports, say marketers, are playing hob with domestic sales, since many consumers whose purity requirements are not too critical are buying and using the foreign material as is.

There's no way of predicting precisely how long the flood of foreign trichloroethylene (and raw-material tetrachloroethane) will continue. There is some agitation for the government to step in with "remedial" blocking measures.

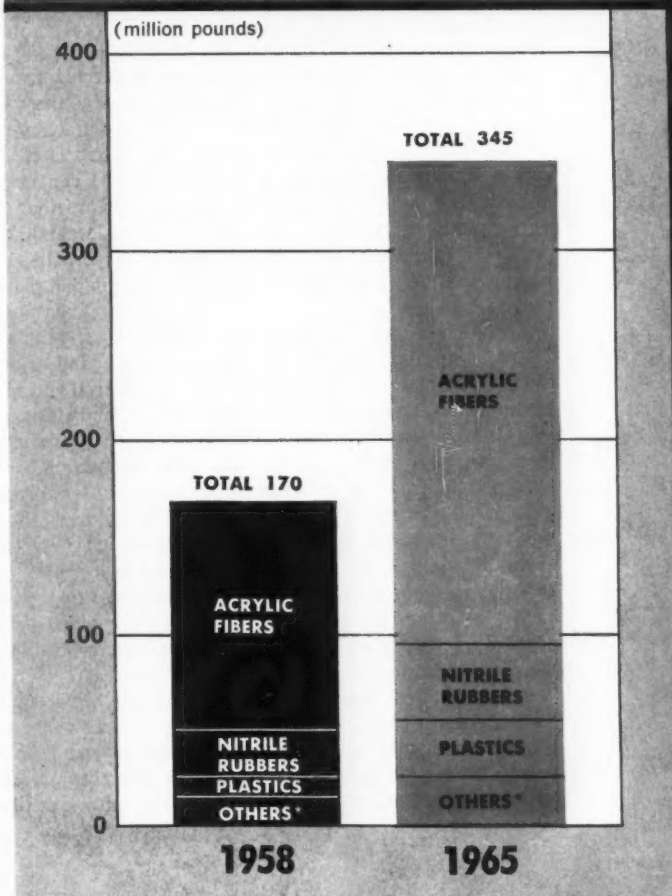
Output-Capacity Spread: U.S. consumption of trichloroethylene currently runs about 400 million lbs./year. In-place industry capacity can turn out close to 500 million lbs./year. With production estimates for this year put at 370 million lbs., it's apparent that imports will con-

U.S. polyvinyl chloride consumption

End-Use	1955	1960	1965
	Est. million pounds		
Molding and extrusion:			
Wire and cable coating	95	125	175
Profiles (auto welting, gaskets, etc.)	20	50	85
Phonograph records	20	45	80
Slush molding (chiefly for dolls and toys)	15	25	55
Rigid piping, fittings	15	25	50
Elastomeric and rigid moldings	15	28	40
Hose	3	17	25
Molding and extrusion, totals	183	315	510
Film and sheeting	134	200	250
Flooring	56	160	245
Textile and paper	64	75	90
Protective coating	26	35	65
Exports*	45	40	30
Miscellaneous**	64	80	110
Grand totals	572	905	1,300

*Excluding exports of fabricated, semifabricated and scrap PVC.
**Not elsewhere classified; includes some PVC captively consumed.

Acrylonitrile use: Growth in prospect



*(Includes exports, inventories, experimental use, etc.)

Neoprene: Where it goes	
Outlet	Percent of total use
Mechanical goods: Hose, belting, molded items, automotive products, adhesives, packings, gaskets, etc.	50%
Wire and cable	25%
Sundries: Coated fabrics, bonded fabrics, sponge and foam, gloves, sporting goods, "small" applications.	22%
Tires	2%
Paper (as a bonding agent)	1%
	100%

tinue to be a source of irritation to U.S. sellers.

About 10% of U.S. trichloroethylene is derived from ethylene dichloride, but it is generally made by the reaction of acetylene with chlorine. Resulting tetrachloroethane is dehydrochlorinated. A 10% lime slurry is used for this dehydrochlorination step. The material can also be produced by thermal cracking of the tetrachloroethane, or by catalytic cracking over a barium chloride catalyst.

At any rate, the crude trichlor from the dehydrochlorination reaction is purified by fractional distillation and then stabilized.

U.S. output over the years has fluctuated (*see table, p. 47*) with the vagaries of market demand, and with the ebb and flow of imports. Perhaps the material's most phenomenal growth period was just prior to, and during, World War II, when the need for a speedy, efficient metal degreaser became a necessity. Vapor degreasing has remained the top outlet; some 93% (about 370 million lbs.) of all the trichlor consumed today is so used. By way of comparison, the degreasing demand in '52 was about 250 million lbs., nearly 92% of total use.

Now, as then, the small remaining amounts are consumed in cleaning compounds, as a freezing-point depressant, heat-exchange liquid, in textile process operations, paper dewaxing, etc.

Degreasing will remain the most important outlet for trichlor, since quality of degreasing-grade material took a giant step forward in '54, when neutral-type stabilizers were introduced. Now, any metal may be degreased without danger of corrosion, even in the presence of moisture.

Another boost was the recent development of trichlor-based phosphatizing and trichlor-based painting. Prospect: hefty sales to the metals-finishing market.

The new processes, developed and being promoted by Du Pont, use trichloroethylene to link the three basic stages of metal finishing—degreasing, phosphatizing and painting. (Phosphatizing applies an almost imperceptible, yet critical, phosphate coating to steel. Object: to promote the paint adhesion, enhance corrosion resistance of finished parts.)

Trichloroethylene is also employed as a thinner in dip-painting, the third stage.

There are two successful full-scale test installations* now in operation, says Du Pont. But its Triclene phosphatizing process will not be commercially available for several months.

Drycleaning Perc: Drycleaning, the prime outlet for perchloroethylene, took approximately 160 millions lbs. last year, or about 78% of the total consumed.

The balance of the estimated 205-million-lbs. output went into metal-cleaning operations (22 million lbs.), chemical synthesis (14 million lbs.), and miscellaneous industrial applications. Sidelight: although drycleaning establishments in the U.S. have increased (from about 20,000 plants in '53 to 35,000 today), and volume of perchloroethylene sold to this industry has risen, dollar sales (about $25 million/year) have remained static. Reason: a combination of increased drycleaning efficiency and rough competitive marketing.

Over the years, trichloroethylene and perchloroethylene requirements for acetylene have inched up rather than surged. In '55 these chlorinated products accounted for some 80 million lbs. of acetylene. Trade experts add about 10 million lbs. to arrive at a figure for '60. They are expecting an increase to about 110 million lbs. by '65.

Acrylonitrile

The five-year outlook for acrylonitrile was charted in CW Reports on ethylene and ethylene derivatives (*CW, April 25 and May 9, '59*) and propylene (*CW, Nov. 14, '59*). Some demand-swelling developments, hinted at then, have since materialized.

For example, Du Pont, long the major U.S. acrylonitrile buyer (for its Orlon operations), is building an acetylene-hydrogen cyanide acrylonitrile plant at Memphis, Tenn. The firm's HCN unit there will be expanded to satisfy the increased need.

Calcium carbide-derived acetylene will come from Union Carbide's nearby Memphis plant. Union Carbide, which has been an important acrylonitrile supplier to Du Pont, will convert an idle ferro-alloy unit at Sheffield, Ala., to calcium carbide production (*CW, Oct. 17, '59, p. 35*). The carbide will be shipped to the company's Memphis plant, where it will be used in generating the acetylene that will be piped to Du Pont.

There are no confirmed data on size of the upcoming operations; but the acrylonitrile plant capacity, generally believed to be 25-30 million lbs./year, may be twice

* At General Motors (Chevrolet), Tonawanda, N.Y., and General Electric (Power Transformer Dept.), Pittsfield, Mass.

that size. This would call for a Memphis acetylene requirement from Union Carbide of some 40 million lbs. annually, and a Sheffield carbide capacity of 60,000 tons/year.

Du Pont also made acrylonitrile news last fall when it confirmed reports that it would build a plant, based on propylene (*CW, Oct. 24, '59, p. 26*), at Beaumont, Tex. The proposed unit will be the second in the U.S. to depart from the well-known ethylene oxide or acetylene routes; Sohio's plant at Lima, O., due onstream shortly, is the first.

Too Much Now: More pertinent than expanding capacity is the question of how soon excess acrylonitrile capacity will be absorbed.

Without even including the two Du Pont ventures, five U.S. acrylonitrile makers (American Cyanamid, Monsanto, Union Carbide, B. F. Goodrich, and Sohio), could turn out substantially more than 350 million lbs./year. By next year, when the Beaumont and Memphis installations are operating, total U.S. capacity will approach 500 million lbs.

Against that top-heavy potential, acrylonitrile production last year barely touched 230 million lbs. Consumption was closer to 220 million lbs. About 70% went for acrylic fibers.

Future of acrylic and acrylic-type synthetic fibers (Acrilan, Creslan, Dynel, Orlon, Verel, Zefran) is one of the brightest features of the textile field. Over the next few years these fibers will continue to account for the bulk of the acrylonitrile consumption.

And development work now under way on acrylic filaments and texturized yarns, could further swell acrylonitrile consumption in textiles. Du Pont has a textured Orlon filament (Cantrece); American Cyanamid and Union Carbide, trade reports say, may soon come out with new acrylic-containing filaments.

Consumption of acrylonitrile in other outlets (e.g., nitrile-type rubbers, plastics) will continue to show gradual increases over the next five years. As new foreign plants begin producing, however, U.S. exports will decrease.

On the whole, though, acetylene will benefit far more than ethylene or propylene from acrylonitrile growth. At least 80% of acrylonitrile capacity in-place and building, will use acetylene as raw material. This source could take 120 million lbs. of acetylene this year and boost its requirement 45% by '65.

Vinyl Acetate

A scant five years ago vinyl acetate was a slow-runner in the plastics race. Today this situation is changing. Vinyl acetate production is expected to reach some 230 million lbs. in '60, an increase of nearly 100 million lbs. over output in '55.

Total industry capacity for '60, is an estimated 380 million lbs. (*see table, p. 54*). This includes a 50-million-lbs./-year Shawinigan Products plant at Shawinigan Falls, Que. (About 80% of the imported Canadian material is taken by Shawinigan Resins at Springfield, Mass.)

Heightened demand for vinyl acetate monomer was behind Air Reduction's doubling of its Calvert City plant, to about 90 millions lbs./year, in mid-'59. It expanded the plant from an initial 30 million lbs. to 45 million lbs. the previous year.

Although capacity in-place is now considerably in excess of demand, producers are inclined to regard the overage more as insurance than as a liability. And at least one optimist insists that projected demand (from latex paints, adhesives, safety glass, textile processing) will require additional vinyl acetate capacity within five years.

Four-Way Split: There are now four major products made from the monomer: polyvinyl acetate, polyvinyl alcohol, polyvinyl butyral, and vinyl chloride-vinyl acetate copolymers. About 7% of the total consumed goes to miscellaneous uses, including polyvinyl formal, polyvinylpyrrolidone, textile chemicals, etc.

Polyvinyl acetate (including homopolymers and copolymers for latex paints) takes by far the largest chunk of monomer production. Estimated monomer need this year is 155 million lbs., compared with 50 million in '55.

One of the biggest spurs to growth of polyvinyl acetate (PVAc) has been the rapid acceptance of latex paints (by do-it-yourself as well as professional painters) for interior and exterior use. The homopolymer of vinyl acetate was introduced initially, but today PVAc latex makers offer a variety of copolymers. Among major producers: Union Carbide, Borden, Celanese, Colton Chemical (Air Reduction), Dewey and Almy, Du Pont, Devoe and Raynolds, National Starch, Reichhold, Shawinigan and Siedlitz Paint & Varnish.

This year consumption of resin emulsion-based paints

U.S. trichloroethylene capacity

Producers		Est. million pounds/year
Du Pont	(Niagara Falls, N. Y., Wyandotte, Mich.)	225
Detrex Chemical	(Ashtabula, O.)	75
Dow	(Freeport, Tex., Midland, Mich.)	70
Hooker Chemical	(Niagara Falls, N. Y., Tacoma, Wash.)	70
Columbia-Southern	(Barberton, O.)	45
		485

Trichloroethylene: Today's applications

Outlet	
Metal degreasing	370
Extraction solvents	17
Other	13
	400

is expected to total about 70 million gal., up some 10 million gal. over that of '57. The older styrene-butadiene type of latex will still account for well over half the total, but PVAc latex should increase its share to more than 30%, or about 22 million gal. By '65 the PVAc emulsion paint market may total 50 million gal.

Adhesives comprise the largest volume use for vinyl acetate monomer, which filters into this market via polyvinyl acetate and PVAc-derived polyvinyl alcohol; the two may be used alone, or combined in adhesive applications. Currently, about 50 million lbs. of PVAc and approximately 12 million lbs. of the alcohol (PVA) are so consumed.

The textile industry is another large user of both PVAc and PVA. The acetate is an excellent bonding agent for fast-growing nonwoven fabrics and consumption will move apace. Last year nonwoven fabric demand amounted to something over 100 million lbs., and this is expected to double over the next three years.

PVAc textile applications also include use as a bodying and stiffening agent, a binder for pigments and external finishes, and to provide protection against abrasion.

In addition, the textile trade this year will consume some 4-5 million lbs. of polyvinyl alcohol for sizing of nylon, cotton and rayon, as a binder and as a finish.

Most notable feature of the polyvinyl alcohol market is the explosive capacity increase now under way. It will boost the U.S. total by mid-'60 to about 66 million lbs./year. At the end of '59, U.S. capacity was 36 million lbs./year.

Air Reduction's new 20-million-lbs./year polyvinyl alcohol plant at Calvert City, Ky., is now undergoing shakedown runs, and commercial shipments should start within a couple of months.

Also just getting under way: Shawinigan Resins' doubling (to 10 million lbs./year) of PVA capacity at Springfield, Mass.; and a 5-million-lbs./year expansion of Borden's Leominster, Mass., plant to 8 million lbs.

Despite the near-50% excess of capacity over this year's anticipated 24-25-million-lbs. production, producers are banking heavily on expected growth of present PVA markets, and on the new potential of PVA fibers and film.

Use of a water-soluble* film in consumer packaging of detergents, pesticides, tints, etc., is an application that could take up to 8 million lbs./year of the alcohol by '65 (*CW, Oct. 31, '59, p. 53*).

Fiber Interest: Polyvinyl alcohol fibers have stirred much interest in the U.S. over the past several years because of their strength and excellent chemical and rot resistance.

In Japan production of Vinylon PVA fiber is running at about 30 million lbs./year of staple and tow, most of which is used in making fish nets and clothing.

Kurashiki Rayon (Osaka, Japan) has produced the material commercially since '50, and has practically all the country's capacity. Dai Nippon Spinning is also turning out staple Vinylon fiber but on a rather smaller commercial scale.

Air Reduction, which obtained the U.S. rights to a PVA fiber from Kurashiki some years ago, reportedly has spent over $1 million on technical and economic evaluation of the product. The firm has not yet made a decision to launch commercial production in the U.S., although trade talk has often had Airco on the verge of putting up a good-sized plant.

Chances are, if the company decides to go ahead with vinal (the new generic name for fibers containing at least 50% vinyl alcohol by weight), the plant would not be built for a year or two.

Possible U.S. outlets for the fiber include knitwear,

* PVA properties can be varied depending on the degree of hydrolysis of the polyvinyl acetate raw material. Partially hydrolyzed grades (87-89%) dissolve readily in water. Completely hydrolyzed, the material has good water resistance and treatment with an aldehyde renders PVA insoluble.

1960 U.S. vinyl acetate consumption

End-Use	Est. million pounds
Polyvinyl acetate (includes homopolymers and copolymers for latex paints)	155
Polyvinyl alcohol	40
Polyvinyl butyral	27
Vinyl chloride-vinyl acetate copolymers	20
Other (polyvinyl formal, PVP, miscellaneous textile chemicals, etc.)	18
	260

1960 vinyl acetate capacity

Producer	Est. million pounds
Union Carbide (Texas City, Tex., Niagara Falls, N. Y.)	95
Air Reduction (Calvert City, Ky.)	90
Du Pont (Niagara Falls, N. Y.)	75
Shawinigan (Shawinigan Falls, Que.)	50
Celanese (Pampa, Tex.)	60
Pacific Carbide (Portland, Ore.)	10
	380

industrial products, floor covering, nonwoven fabrics and, possibly, tire cord.

Safety Glass Pickup: Use of vinyl acetate monomer for polyvinyl butyral safety glass interlayer reflects the rise and fall of U.S. automobile production. Since '58, PVAc monomer consumption for polyvinyl butyral has varied between 25-30 million lbs./year. But hard-sell campaigns to promote the use of laminated safety glass in all car window areas may pay off. This year an estimated 27 million lbs. of acetate monomer will be used to turn out about 18 million lbs. of butyral. At least one market observer foresees a doubling of such monomer need within 3-4 years.

All told, vinyl acetate production (excluding that in Canada) may total 230 million lbs. in '60. Four of the five U.S. makers employ processes based on the reaction of acetic anhydride with acetylene. Celanese, with quantities of acetic anhydride and acetaldehyde available at Pampa, Tex., combines these materials to yield ethylidene diacetate as an intermediate for vinyl acetate production.

This year's acetylene-based vinyl acetate will require some 55 million lbs. of acetylene. By '65, the need will likely increase to about 80 million lbs./year.

Other Derivatives

In addition to the older, established acetylene outlets, there is a growing list of newer derivatives that will contribute significantly to greater acetylene use.

In addition, acetylene is branching out into new plastic fields. Du Pont, for instance, is making ready for large-scale production of Teslar, an acetylene-based film (polyvinyl fluoride). General Aniline; Arnold, Hoffman, and others have been developing fibers of polyvinylpyrrolidone, which may become competitive—in price and use—with nylon.

Acrylates Out Front: Front-runners of the miscellaneous category are the acrylates. Total U.S. capacity, including Dow Badische's new plant at Freeport, Tex., is about 80 million lbs./year.

Here's a rundown of producers, and estimates of acrylates' capability (in million pounds/year): Rohm & Haas, 35; Union Carbide, 16; Celanese, 14; Dow Badische, 15; total 80.

Of the four, Rohm & Haas and Dow Badische use acetylene as a raw material. Union Carbide utilizes a low-cost ethylene cyanohydrin process based on HCN and ethylene oxide; the company began production of acrylate esters at Institute, W. Va. in '49.

Celanese's acrylate production, at Pampa, Tex., under license from Goodrich, uses ketene (from acetone or acetic acid) and formaldehyde to form propiolactone, which reacts with an alcohol in the presence of acid.

Dow Badische, jointly owned by Dow Chemical and Badische Anilin- & Soda-Fabrik, will turn out acrylate esters via direct esterification of acrylic acid made from acetylene, carbon monoxide and water by a Reppe catalytic process (*CW, Aug. 1, '59, p. 60*).

Rohm & Haas is the largest producer of acrylate monomers and the only maker of both acrylates and methacrylates in the U.S. Only since '53, though, did it swing over to using acetylene and carbon monoxide as raw materials for its acrylates.

Late in February, when it was revealed that R&H had successfully bid for the old government butadiene plant at Louisville, Ky. (*CW Business Newsletter, Feb. 20*), there was much trade speculation as to the ultimate use the firm would make of the facilities. Only definite comment by company officials was that R&H had no intention of producing butadiene, will use the plant for products in its own established fields.

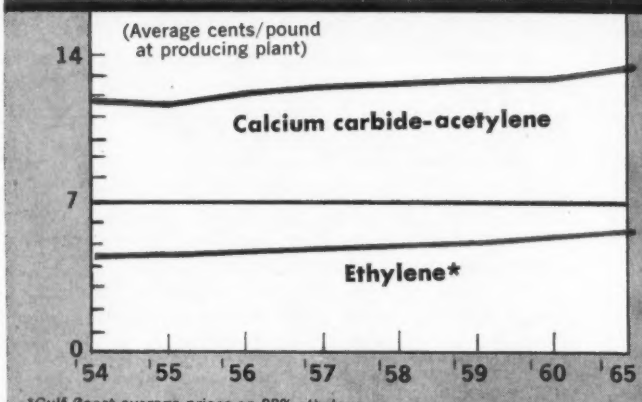
It's not beyond the realm of possibility that new acrylate and methacrylate facilities may be based at Louisville.

The advent of Dow Badische's monomer plant aggra-

Acetylene and ethylene in competition

Ethylene route	Product	Acetylene route
Direct thermal chlorination; Cl_2 addition, HCl removal	Vinyl chloride	Direct HCl addition
None	Neoprene	Acetylene to monovinylacetylene to chloroprene to neoprene
As by-product of ethylene glycol manufacture via ethylene dichloride	Trichloroethylene	Chlorine addition to yield tetrachloroethane, followed by dehydrochlorination
Oxidation to ethylene oxide followed by HCN addition and dehydration	Acrylonitrile	Direct HCN addition
None	Vinyl acetate	Direct acetic acid addition
Hydration to ethyl alcohol, then dehydrogenation to acetaldehyde	Acetaldehyde	Direct H_2O addition

Acetylene-ethylene price patterns



*Gulf Coast average prices on 98% ethylene.

vates an overcapacity problem not likely to be solved for at least four or five years.

Not until then are total acrylate sales—ethyl acrylate is the most important ester in the acrylates group—expected to reach the 80-million lbs./year level. Last year about half that quantity was consumed, with a good part of it going to the comparatively newer acrylic paints. This market undoubtedly was one big reason for Dow's acrylate entry; it is now marketing an acrylic paint.

Total acrylates demand this year for paints, leather, paper, polymer-based polishes, specialty rubbers, plastics, etc., is estimated at slightly under 50 million lbs.

Broadening Acetylenics: A growing list of minor derivatives may one day contribute significantly to acetylene growth. Today only a few have actually reached commercial or semicommercial status. Among them are some of General Aniline & Film's high-pressure acetylene products, including polyvinylpyrrolidone (PVP) and newer PVP copolymers, propargyl alcohol, butynediol, butyrolactone.

In '58, Air Reduction pushed two low-pressure acetylenic alcohols (methylbutynol and methylpentynol) to full-scale production in a 3-million-lbs./year plant at Calvert City, Ky. These products are used in production of hypnotics and tranquilizers, and have promise as intermediates for Vitamin A, ionones, other isoprenoid chemicals.

Total market for acetylenics now doesn't exceed 25 million lbs./year, but this could well double by '65.

Ethyl and methyl acrylates, Reppe chemicals, higher vinyl esters, vinyl ethers, acetylenic glycols and alcohols as a group are expected to account for approximately 65 million lbs. of acetylene this year, about 8% of total U.S. consumption, compared with an estimated 15-million-lbs. use in '55.

Shifting Acetylene Technology

One towering feature of the acetylene picture is capacity —there is no threat of supply shortage. U.S. capacity for '60 will total nearly 1.2 billion lbs./year, up more than 25% over capacity in place as recently as '55.

Consumption this year for manufacture of chemicals should be close to 760 million lbs. The projection for '65, despite anticipated inroads by ethylene and propylene, is for chemical demand in the neighborhood of 995 million lbs.

Compared with the five-year growth pattern for ethylene (5 billion lbs. in '60, 6.5 billion in '65) and propylene (2.26 billion lbs. vs. 3.1 billion lbs.), acetylene's consumption curve rises slowly (*see chart, p. 46*).

Since World War II, acetylene growth has hovered between 7-8%/year, somewhat less precipitous a climb than in the prior decade. In '39, for example, acetylene production totaled less than 90 million lbs., but increased some 300 million lbs./year by the mid-'40s.

Beginning in '56, however, acetylene consumption began a steeper climb. Chief reason: burgeoning production and use of most acetylene derivatives, notably vinyl chloride.

Is calcium carbide on the way out as a major source of acetylene? This poser has popped up periodically since '52, when calcium carbide's exclusive hold on the acetylene industry was broken with startup of three major plants that convert natural gas into acetylene. The units belong to Monsanto, Union Carbide (both at Texas City) and American Cyanamid (Fortier, La.). Three years later, Rohm & Haas joined in with a plant at Deer Park, Tex.

Biggest assurance that the carbide-acetylene route is not slated for an early demise lies in the rundown of current U.S. acetylene facilities (*see table p. 57*). Just about 1 billion lbs. of acetylene capacity is based on the "classic" process that has been in use in the U.S. since the early 1890s.

By comparison, slightly less than 300 million lbs./year can be produced in hydrocarbon-based plants.

Output Up: U.S. production of calcium carbide last year just about touched the 1-million-tons mark, reversing '57-'58 downturn. Output for '60 is expected to exceed the previous high (nearly 1.03 million tons), which was reached in '56.

Total U.S. carbide capacity is divided among four major producers, National Carbide (Air Reduction), Union Carbide, Midwest Carbide and Pacific Carbide & Alloys (*see table, p. 68*). Combined potential: 1.28 million tons/year.

Aside from Union Carbide's conversion of its Sheffield, Ala., ferro-alloy plant to carbide production (for Du Pont's Memphis, Tenn., acrylonitrile project), the line-up has changed little since '53. That's when Air Reduction's giant Calvert City carbide-acetylene complex began operations.

Bigger Needs: The spread between in-place calcium carbide capacity and demand is narrowing rapidly. Foreseeable requirements—primarily for chemical-acetylene—indicate that additional carbide capacity will be needed by '63.

Bolstering the belief that the carbide route is far from obsolete is speculation that Air Reduction is contemplating additional carbide (and acetylene) units for its Calvert City site.

More than 75% of the carbide produced in the U.S. is channeled into chemical manufacture; the remainder is sold as industrial carbide or used for cylinder acetylene. The production cuts in '57 and '58, for the most part, were induced by a fall-off in consumption of acetylene for nonchemical uses (e.g., industrial construction), rather than a decline in chemical use.

The high cost of shipping carbide has spawned clusters of acetylene consumers around carbide-acetylene plants. But there are relatively few locations (e.g., Niagara Falls, Ashtabula, Calvert City and a few others) in the U.S. that have satisfactory combinations of low-cost power and raw materials for pipeline acetylene, and this will be a limiting factor in any increase of carbide-acetylene plants.

Hydrocarbon Synthesis: There are perhaps a dozen variations of processes by which acetylene can be produced using commercially attractive feedstocks ranging from methane to heavy oil. Among companies with processes in various stages of commercial development are Badische Anilin- & Soda-Fabrik (BASF process, formerly

Major U.S. acetylene producers, plants, processes

1960 capacities; est. million pounds

Producer	Plant Location	Acetylene raw material: Calcium Carbide	Acetylene raw material: Hydrocarbon
Air Reduction	Calvert City, Ky.	250	—
	Louisville, Ky.	100	—
	Ivanhoe, Va.	50	—
	Keokuk, Ia.	20	—
Allied Chemical	Moundsville, W. Va.	50	—
American Cyanamid	Avondale, La.	—	100
Dow Chemical	Freeport, Tex.	—	8*
Midwest Carbide	Pryor, Okla.	20	—
	Keokuk, Ia.	30	—
Monsanto	Texas City, Tex.	—	80
Pacific Carbide	Portland, Ore.	15	—
Rohm & Haas	Deer Park, Tex.	—	35
Union Carbide	Niagara Falls, N. Y.	150	—
	Ashtabula, O.	150	—
	Sault Ste. Marie, Mich.	50	—
	Portland, Ore.	10	—
	Montague, Mich.	50	—
	Texas City, Tex.	—	75
	So. Charleston, W. Va.	15	—
	Memphis, Tenn.	40	—
Wulff Process	Los Angeles, Calif.	—	1
		1,000	299
	Grand total	1,299	

*Dow currently operating pilot-plant installation, but reportedly contemplating 40-50-million-lbs./year plant.

known as "Sachsse"), Chemische Werke Huels, Farbwerke Hoechst AG., Montecatini, Phillips Petroleum, Schoch (University of Texas), Societe Belge de l'Azote (SBA), Tennessee Eastman, Wulff Process. And a Japanese firm, Tsutsumi, recently developed a process that reportedly gives excellent results with stocks as heavy as black oil.

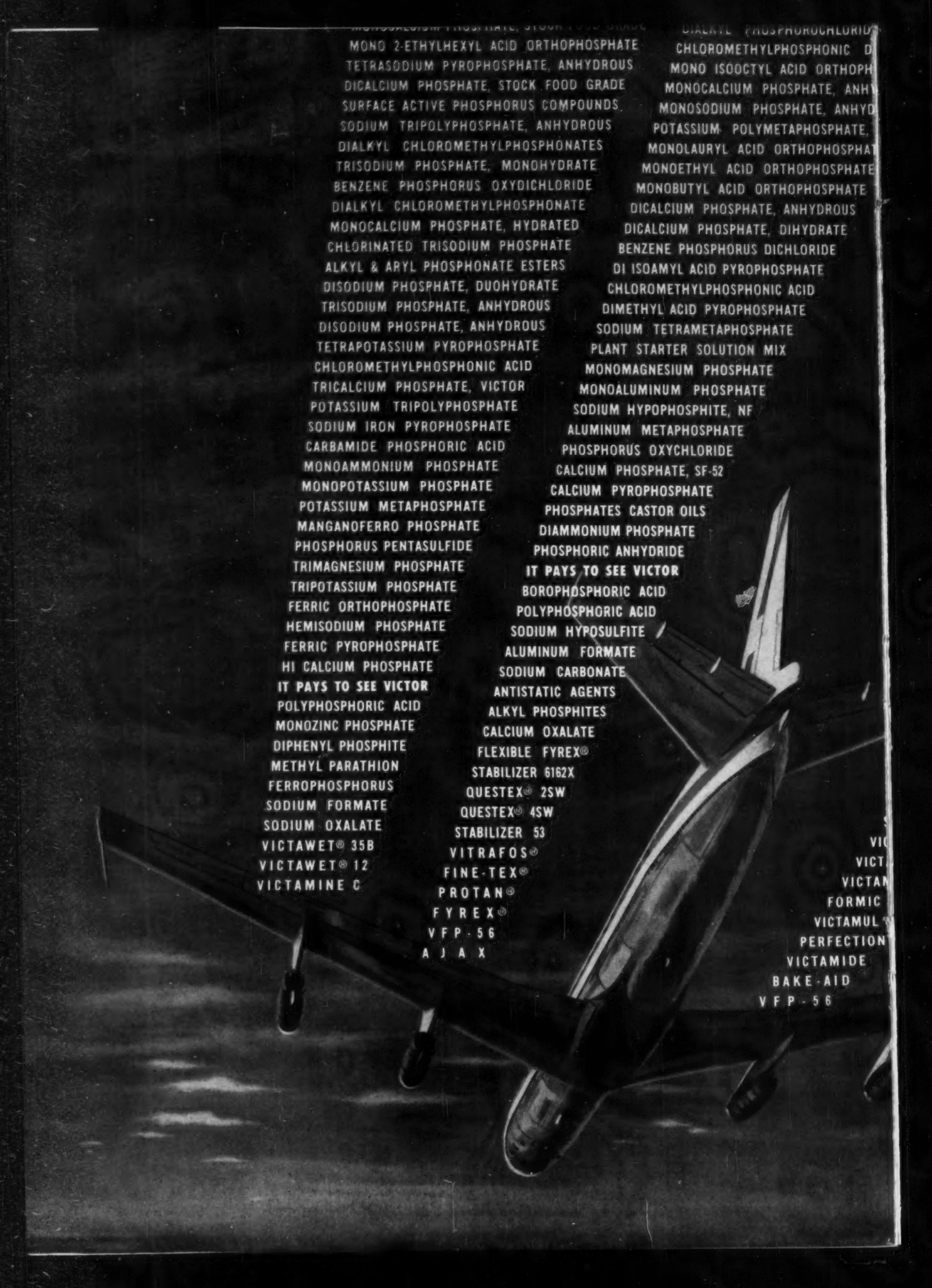
Basically, the manufacture of acetylene from saturated hydrocarbons (e.g., natural gas, propane, oil) calls for considerable amounts of energy supplied at high temperatures and incredibly short residence time (i.e., milliseconds) of the feedstock. Reason for the latter: the high temperatures required for the formation of acetylene are fairly close to that at which it decomposes. The various licensed processes use either an electric arc or the heat of combustion to supply the necessary energy.

Huels pioneered a direct current electric arc technique and operates a large-scale plant in Germany. Methane, obtained by low-temperature purification of coke-oven gas, is pumped through an electric arc at high speed to yield acetylene and considerable quantities of carbon black.

In early '42, Eugene Schoch of the University of Texas, began research that has led to the pilot-planting of a method of electric arc-cracking of natural gas. The process was sold to Esso Research and Engineering in late '58.

Others have investigated use of electricity as the source

(*Continued on p. 68*)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SURFACE ACTIVE PHOSPHORUS COMPOUNDS
SODIUM TRIPOLYPHOSPHATE, ANHYDROUS
DIALKYL CHLOROMETHYLPHOSPHONATES
TRISODIUM PHOSPHATE, MONOHYDRATE
BENZENE PHOSPHORUS OXYDICHLORIDE
DIALKYL CHLOROMETHYLPHOSPHONATE
MONOCALCIUM PHOSPHATE, HYDRATED
CHLORINATED TRISODIUM PHOSPHATE
ALKYL & ARYL PHOSPHONATE ESTERS
DISODIUM PHOSPHATE, DUOHYDRATE
TRISODIUM PHOSPHATE, ANHYDROUS
DISODIUM PHOSPHATE, ANHYDROUS
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CHLOROMETHYLPHOSPHONIC ACID
TRICALCIUM PHOSPHATE, VICTOR
POTASSIUM TRIPOLYPHOSPHATE
SODIUM IRON PYROPHOSPHATE
CARBAMIDE PHOSPHORIC ACID
MONOAMMONIUM PHOSPHATE
MONOPOTASSIUM PHOSPHATE
POTASSIUM METAPHOSPHATE
MANGANOFERRO PHOSPHATE
PHOSPHORUS PENTASULFIDE
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METHYL PARATHION
FERROPHOSPHORUS
SODIUM FORMATE
SODIUM OXALATE
VICTAWET® 35B
VICTAWET® 12
VICTAMINE C
CHLOROMETHYLPHOSPHONIC D
MONO ISOOCTYL ACID ORTHOPH
MONOCALCIUM PHOSPHATE, ANH
MONOSODIUM PHOSPHATE, ANHYD
POTASSIUM POLYMETAPHOSPHATE,
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DICALCIUM PHOSPHATE, ANHYDROUS
DICALCIUM PHOSPHATE, DIHYDRATE
BENZENE PHOSPHORUS DICHLORIDE
DI ISOAMYL ACID PYROPHOSPHATE
CHLOROMETHYLPHOSPHONIC ACID
DIMETHYL ACID PYROPHOSPHATE
SODIUM TETRAMETAPHOSPHATE
PLANT STARTER SOLUTION MIX
MONOMAGNESIUM PHOSPHATE
MONOALUMINUM PHOSPHATE
SODIUM HYPOPHOSPHITE, NF
ALUMINUM METAPHOSPHATE
PHOSPHORUS OXYCHLORIDE
CALCIUM PHOSPHATE, SF-52
CALCIUM PYROPHOSPHATE
PHOSPHATES CASTOR OILS
DIAMMONIUM PHOSPHATE
PHOSPHORIC ANHYDRIDE
IT PAYS TO SEE VICTOR
BOROPHOSPHORIC ACID
POLYPHOSPHORIC ACID
SODIUM HYPOSULFITE
ALUMINUM FORMATE
SODIUM CARBONATE
ANTISTATIC AGENTS
ALKYL PHOSPHITES
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STABILIZER 6162X
QUESTEX® 2SW
QUESTEX® 4SW
STABILIZER 53
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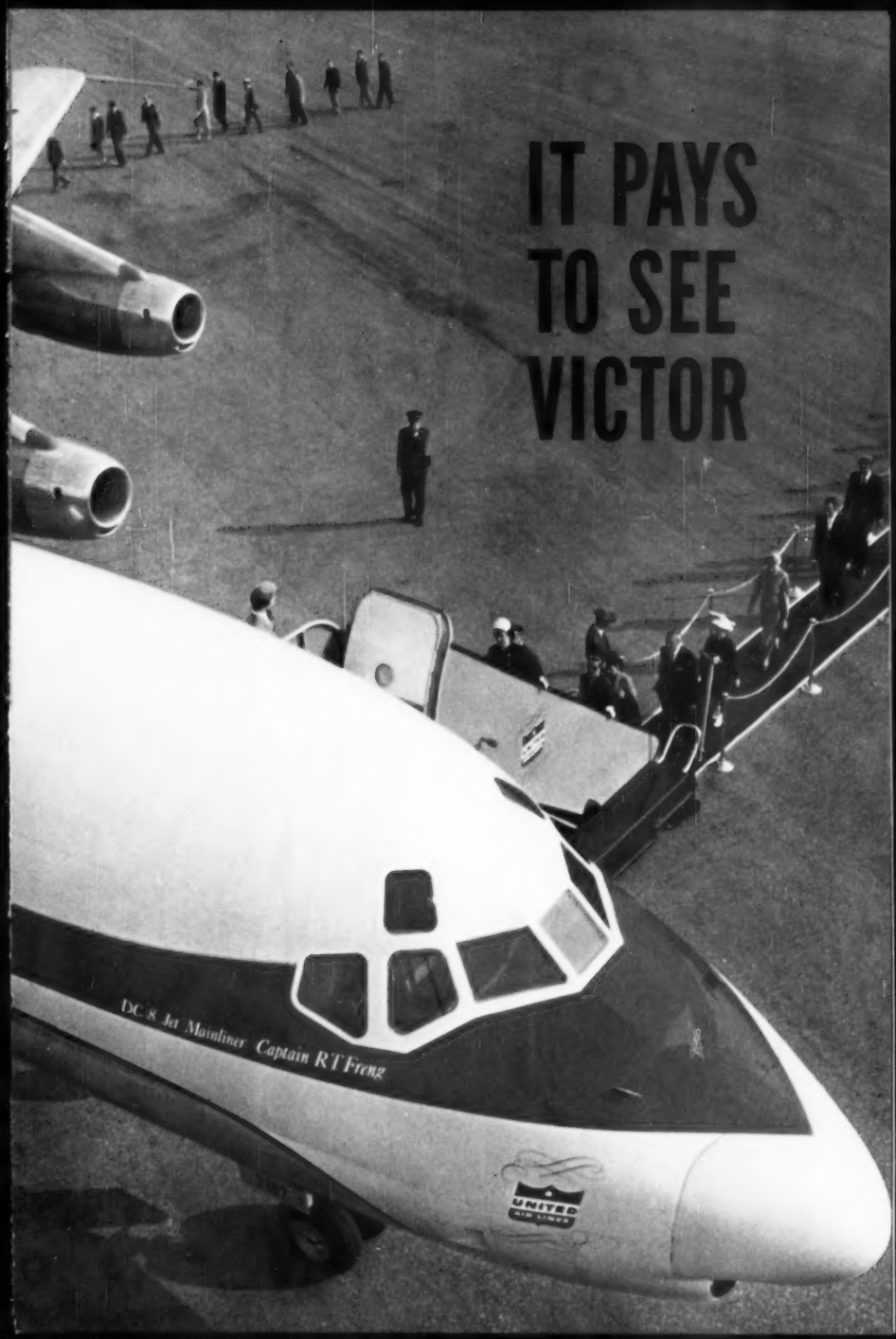
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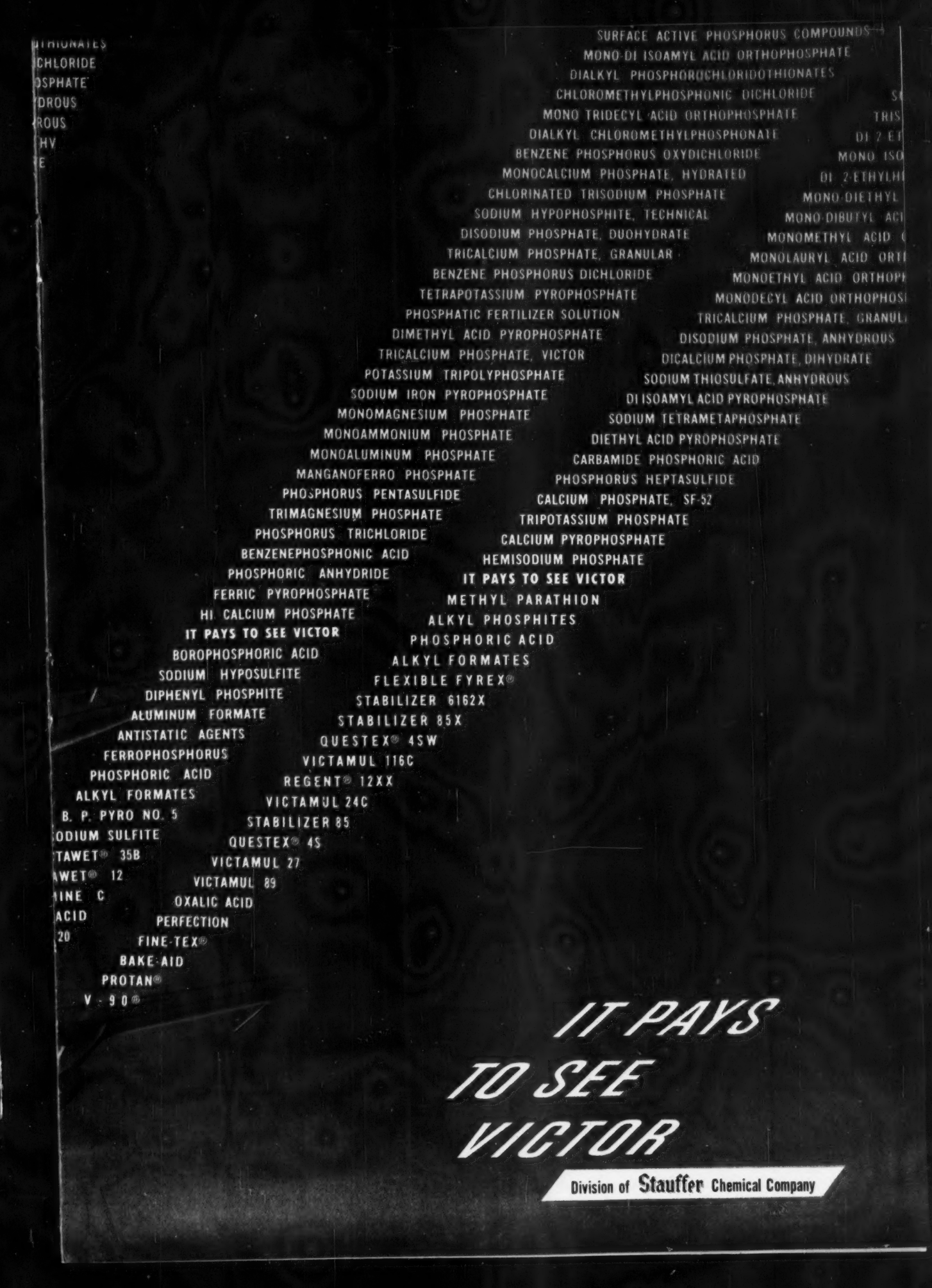
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DISODIUM PHOSPHATE, DUOHYDRATE
TRICALCIUM PHOSPHATE, GRANULAR
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TETRAPOTASSIUM PYROPHOSPHATE
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DIMETHYL ACID PYROPHOSPHATE
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POTASSIUM TRIPOLYPHOSPHATE
SODIUM IRON PYROPHOSPHATE
MONOMAGNESIUM PHOSPHATE
MONOAMMONIUM PHOSPHATE
MONOALUMINUM PHOSPHATE
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of energy in the acetylene production, but commercialization has been stymied by the large electrical requirements. These, reportedly, are about the same as the disadvantageous 4-5 kw.-hr./lb. of acetylene needed in the traditional calcium carbide route.

Utilization of heat as the source of energy is the common denominator in all other hydrocarbon-acetylene processes; heat is supplied either by a flame or by use of a regenerative furnace.

The only installation using a regenerative furnace is that of Wulff Process (Los Angeles). The 1-million-lbs./year test plant has successfully cracked a wide range of feeds.

More intensive development work has involved two general types of flame methods—the partial combustion process and use of a two-stage burner.

In the partial combustion process, methane (or natural gas) and an oxidant—usually oxygen which permits synthesis of by-product methanol or ammonia—are preheated separately. The components are blended in the mixing chamber of a reactor, then burned in a reaction chamber.

The resulting mixture of cracked and combustion gases is quenched immediately and, after removal of carbon black, is purified. Yield of acetylene is higher than in the Wulff process, but disadvantages include a tough carbon-removal problem, only partial recovery of heat in the cracked gases, and the need for an oxygen plant.

Last month, a full-size plant for the production of acetylene from methane (extracted from coke-oven gas) began operating at Carling, France. It's the first such plant in the world, and has been pilot-planted since '53, by SBA in conjunction with Houilleres du Bassin de Lorraine. The Carling acetylene will be used by Ugilor (a subsidiary to up acrylonitrile capacity to 20 million lbs./year.

U.S.A. Picture: The BASF version (or variations) of the partial combustion process is the only one operating commercially in the U.S. Since these plants were constructed in the early '50s, capacities have been expanded considerably, and further expansion is in sight. American Cyanamid, for instance, now has an acetylene potential at Avondale, of just slightly under 100 million lbs./year. Unofficially, Monsanto is said to have increased capacity at Texas City to about 80 million lbs./year.

Union Carbide's natural gas-acetylene plant at Texas City has an estimated annual capacity of 75 million lbs. Bulk of the output, like that of the Wulff plant, goes for nonchemical uses.

The Rohm & Haas installation at Deer Park, Tex., has lately sparked much trade discussion. Gist of the speculation: the firm was having production problems. Actually, an addition to the plant came onstream within the past few weeks, and there may have been "normal" startup difficulties with the new unit.

The R&H plant, which originally had a 17-million-lbs./year capacity, has been doubled in size, and is reported to be currently operating at "rated capacity" of about 35 million lbs./year.

The Dow acetylene unit at Freeport, Tex., has also been the subject of much speculation, with some accounts pegging size at a whopping 60 million lbs./year.

CHEMICAL WEEK learns that Dow is operating a pilot plant using its own partial combustion process, and output is in the neighborhood of 8-10 million lbs./year. Dow, though, may be contemplating a 40-50-million-lbs./year plant for operation within a year or two.

Diamond Alkali, earlier this month, made the long-expected disclosure that it would embark on an acetylene-producing venture. Diamond Alkali Chairman and President Raymond Evans told the New York Society of Security Analysts that the company was "launching a project to produce acetylene by the partial oxidation of natural gas." Diamond now buys acetylene from R & H.

Although President Evans did not elaborate on the process to be used, trade sources believe that the company may become the first U.S. hydrocarbon-acetylene producer to use a method different from the BASF type. At any rate, the company must be included among the upcoming producers who will add some 200 million lbs./year to total U.S. acetylene capacity.

Air Products (Allentown, Pa.), a major supplier of industrial gases, is interested in hydrocarbon-acetylene, although it does not now sell acetylene for chemical synthesis.

Plans call for a cluster of acetylene customers around

U.S. calcium carbide capacity

Company	Plant Location	Est. Tons/year
Air Reduction	Calvert City, Ky.	300,000
	Louisville, Ky.	150,000
	Ivanhoe, Va.	79,000
	Keokuk, Ia.	36,000
	Total Airco	**565,000**
Union Carbide	Ashtabula, O.	228,000
	Niagara Falls, N. Y.	210,000
	Sault Ste. Marie, Mich.	90,000
	Sheffield, Ala.	60,000
	Portland, Ore.	32,000
	Total UCC	**620,000**
Midwest Carbide	Keokuk, Ia.	50,000
	Pryor, Okla.	30,000
	Total Midwest	**80,000**
Pacific Carbide & Alloys	Portland, Ore.	17,000
	Total PCA	**17,000**
	Grand total	**1,282,000**

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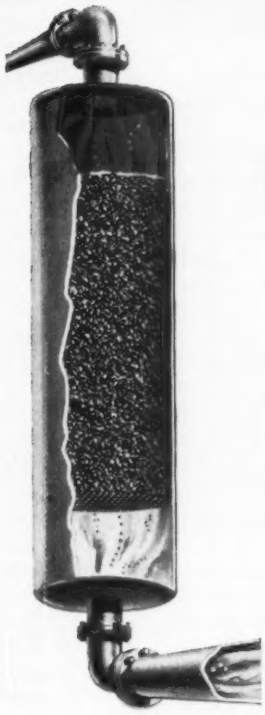

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a proposed Air Products hydrocarbon-acetylene plant on the Gulf Coast. The arrangement will be similar to present groupings of consumers around calcium carbide-acetylene complexes.

Two-Stage Stepping: Within the past few years, hydrocarbon-acetylene proposals—particularly concerning two-stage burners—have come thick and fast.

Several two-stage acetylene converter designs, for example, have been patented, and are being enthusiastically promoted. To date, though, only one such plant has reached the stage of initial commercialization—the Hoechst (West Germany) installation of Farbwerke Hoechst AG. Capacity will be close to 100 million lbs./year of acetylene plus ethylene. Net yields of 50-54% of combined product are claimed from light virgin naphtha and a 40% acetylene yield is claimed with methane.

In the Hoechst high-temperature pyrolysis (HTP) process, residual gas from the purification unit is burned with oxygen to provide energy for the cracking operation.

M. W. Kellogg (New York) and SBA, working together, have come up with an acetylene-ethylene process based on partial oxidation of naphtha or natural gas feeds.

Phillips Petroleum has a two-stage burner featuring a "tangential reactor" unit, in which fuel and oxidant enter a combustion chamber tangentially to cylindrical walls. A cracking stock then flows into the chamber; the two streams mix and pass from the cylindrical combustor to a smaller-diameter cylindrical chamber for acetylene formation and quenching.

Tennessee Eastman and SBA have done extensive work using light hydrocarbon feedstocks. The process went up for licensing in '58; Stone & Webster Engineering (Boston) will design and construct commercial plants. Huels, in Germany, incidentally, is operating an Eastman reactor to supplement acetylene production from its dc. electric-arc cracking.

A late report from the Institute for Petroleum Research in Brno, Czechoslovakia, reveals a new process utilizing an alternating-current electric arc for production of acetylene and ethylene from hydrocarbons. Claim: combined yields of acetylene and ethylene, based on a methane feed, run about 58%. By comparison, the Huels plant reportedly gets 40-50%.

These examples underscore the continuing fast-paced development of the hydrocarbon-acetylene field.

A new "low-cost" nonhydrocarbon route to acetylene (*CW Technology Newsletter, Feb. 20*) could mean still more competition for calcium carbide. Key to the new process, developed by Ionics, Inc. (Cambridge, Mass.), is use of barium carbide instead of calcium carbide.

Details are still undisclosed, but knowledgeable sources insist that barium is too scarce and too costly to compete with calcium—unless the barium carbide process contains a cost-cutting gimmick. One possibility: the barium could be recycled from the acetylene-generating system to the carbide furnace, where it can be made into carbide at lower temperatures than can calcium.

Intense research, now under way, could lead to large-scale use of anthracite wastes as an acetylene raw material. Philadelphia & Reading, for one, early this month (*CW, March 5, p. 24*) formed Reading Chemical to press ahead on a proposed power and chemicals complex in the Pottsville, Pa., area. One project involves reaction of anthracite residue with limestone to produce calcium carbide, acetylene and vinyl chloride.

Cost Determinant: Comparative costs of producing hydrocarbon and nonhydrocarbon acetylene are difficult to determine. Involved are availability and costs of raw materials, transportation, labor, power, location of consumers, equipment and plant size, by-product use, etc.

Calcium carbide boosters invariably point out that acetylene made via the oldline route is of high enough purity (at least 99.6%) to meet all requirements for chemicals manufacture. By contrast, all current hydrocarbon processes yield a raw cracked gas that contains relatively low concentrations of acetylene (less than 20% by volume is common).

Separation of diluents, such as methyl acetylene, vinyl acetylene, diacetylene, aromatics, etc., thus becomes one of the major cost factors. In addition, there's an acetylene-purification cost problem that has turned the spotlight on a long list of potentially suitable acetylene solvents. Among those currently used are anhydrous ammonia, methanol, dimethylformamide, butyrolactone.

These additional steps to high-purity acetylene can push the over-all capital investment for a hydrocarbon-based acetylene plant to about double that needed for a carbide-acetylene installation of the same capacity.

Merchant acetylene from calcium carbide generally sells at prices ranging from 12½¢-14¢/lb., depending on location of the consumer. At present, almost all hydrocarbon-acetylene produced in the U.S. is captive.

To most trade observers, it has become apparent—despite a welter of claims and counterclaims—that there is no well-defined major cost difference between carbide and hydrocarbon acetylene processes. Depending on the various factors involved, a carbide-acetylene plant may be more economical in one situation, a hydrocarbon-acetylene plant in another.

It's a cinch that if acetylene could be sold at lower-than-present prices, producers insist, it would be if only to improve its competitive position in relation to other oelfinic raw materials. Ethylene, for instance, is being produced in the U.S. at considerably less than half the price/lb. of acetylene (*see table, p. 55*). Fast-stepping high-purity propylene, though still not in the big leagues as a chemical raw material, is being quoted to prospective customers at prices ranging ½¢-1¢/lb. under ethylene.

The various acetylene processes will continue to be refined and improved. Few producers, however, hold any hope that manufacturing costs can soon allow an acetylene price anywhere near the 5¢-6¢/lb. level. The best prospect is for an eventual tag in the 9-11¢ range, and this only if multicustomer hydrocarbon-based complexes (such as envisioned by Air Products) prove feasible.

Thus, despite the anticipated market growth of acetylene derivatives, prospects for acetylene, at least through '65, will depend primarily on price. In essence, it's an outlook that can only be described as moderate.

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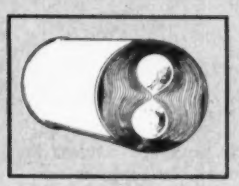
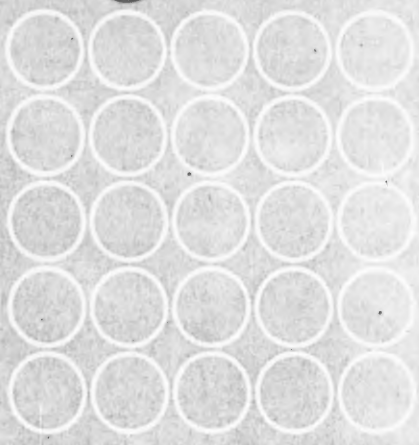
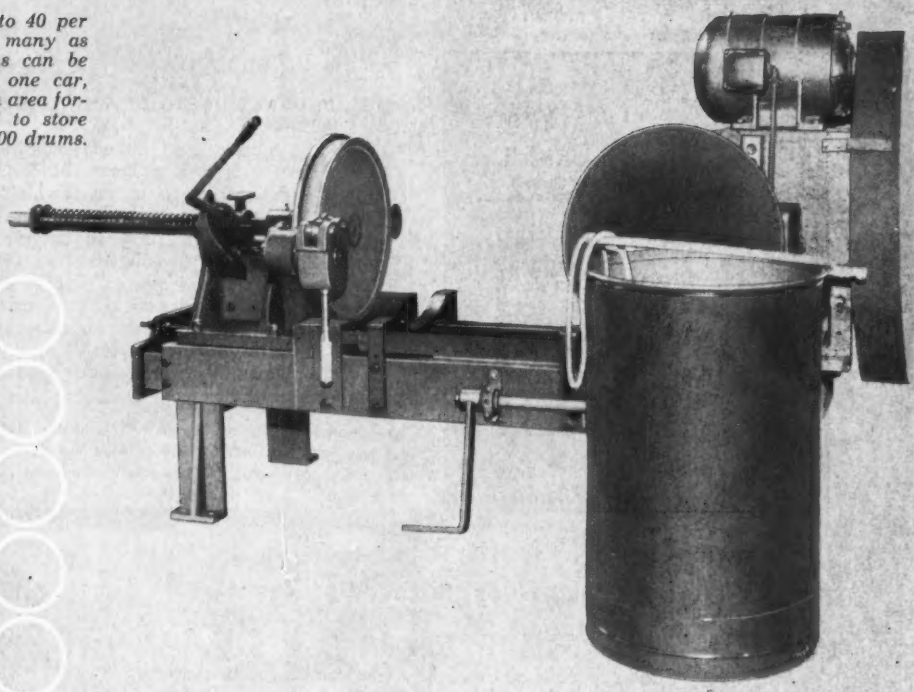
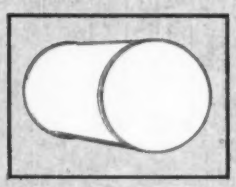


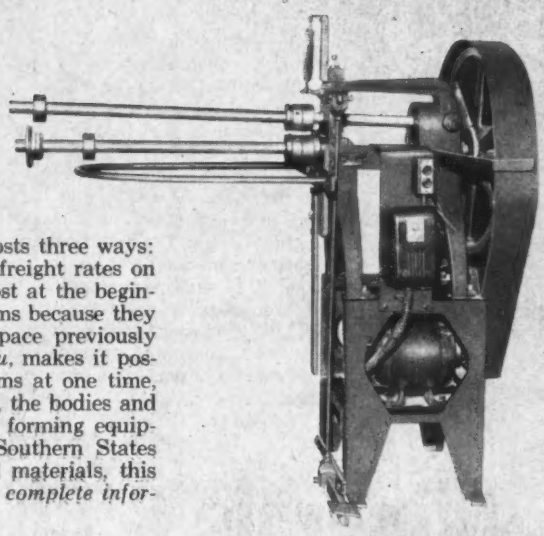
Nested 25 to 40 per bundle, as many as 2,000 drums can be shipped in one car, stored in an area formerly used to store as few as 300 drums.







Drum shells are easily assembled into completed container with the bottoms, heads, gaskets and closing rings provided separately packaged.



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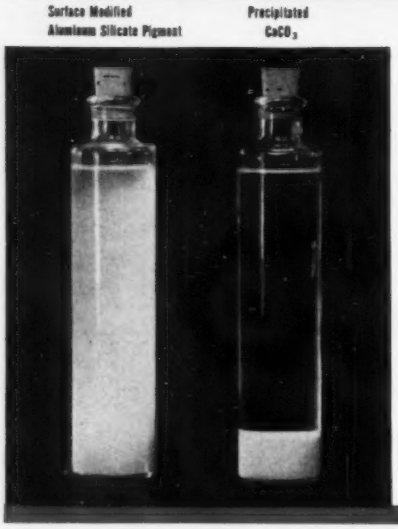

*New Organophilic ASP's . . . surface modified aluminum silicate pigments designed for organic service

Now the superior performance exhibited by ASP's in aqueous systems is available for organic systems. M & C-developed methods bring a new line of aluminum silicate pigments which are *organophilic* with "*hydrophobic*" properties—they take to organic liquids but shun water. The Surface Modified ASP's offer these advantages: (1) excellent suspension, (2) improved flow, (3) little emulsification, (4) fast dispersion, (5) easy wetting. This performance is due in part to the ability of these *new ASP's* to resist physical adsorption of water during storage, resistance to changes brought about by the presence of small amounts of water in organic systems, and on affinity exhibited for them by organic systems. Put aluminum silicate pigments to work in *your* products. This is a *starred item* . . . check and send in the coupon.

◀ Superiority of Surface Modified ASP's shown in unretouched photograph of settling test. Equal amounts of Surface Modified ASP and precipitated $CaCO_3$ were added to mineral spirits, bottles shaken and picture taken 30 minutes later.

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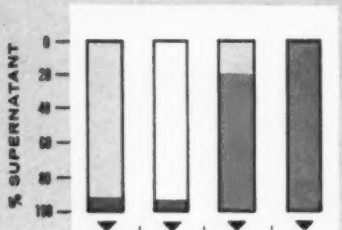
Settling Time . . . Material Costs of Attagel 20 Formulations



Attagel 20, %	0.00	1.00	2.50	5.00
Surfactant, %	0.00	0.33	0.83	1.70
Mineral Spirits, %	75.00	73.67	71.56	68.30
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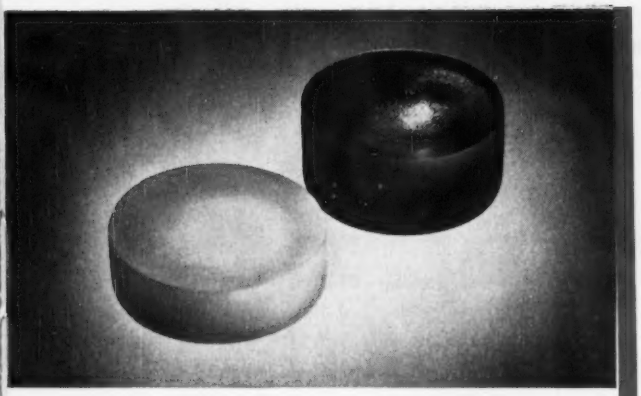

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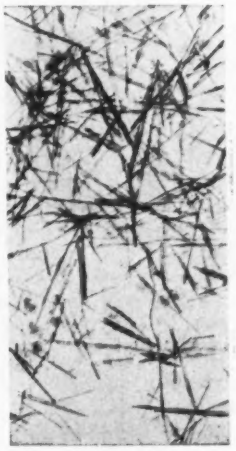
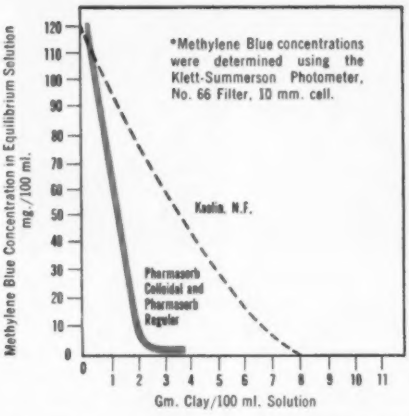


"Imaginapplication" of these properties led Attapulgus Clays into such diverse jobs as carriers for liquids, dispersing small quantities uniformly through large masses of solids or dispensing easily as solids; binding foundry sands; cleaning floors—and furs; thermal insulation; absorbing moisture in solids to shorten drying cycles; and high temperature mastic sealing . . . jobs now performed better than before and like-as-not at less cost—thanks to the properties built-in by nature. Look into the possibilities for improving *your* products with the Attapulgus Clays . . . use the coupon.



Adsorption of Methylene Blue from aqueous solution (120 mg./100 ml.) by Pharmasorbs and Kaolin, N.F.*

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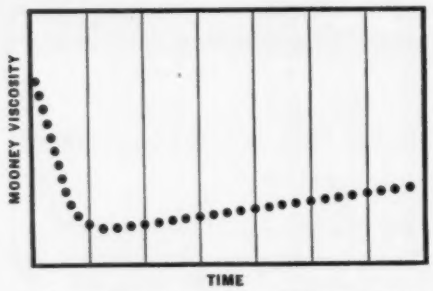

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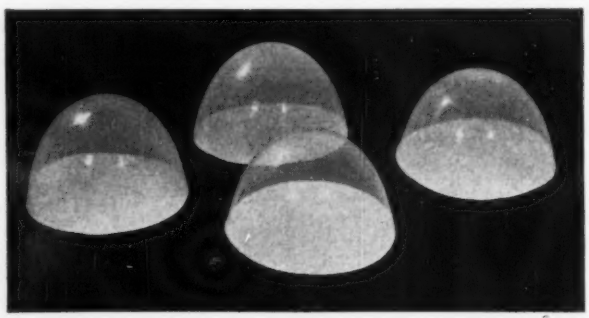

KEL-F DISPERSION FILM was chosen for these radome covers by Hughes Aircraft for its fine thermal-insulating qualities, zero-moisture absorption and excellent chemical stability. Under actual operating conditions, temperatures inside the radome were reduced as much as 170° F., permitting trouble-free, efficient operation of the electronic system enclosed. In addition, the cover offers maximum resistance to moisture and erosion. These covers were made by the National Glaco Chemical Corporation, a subsidiary of Ekco Products Co., Whittier, Calif.

FLUOREL Elastomer and KEL-F Plastic are two of the more than 300 specialty chemicals for industry from 3M. Write 3M Chemical Division for information on Acids, Binding Resins, Elastomers, Plastics, Oils, Waxes and Greases, Dispersions, Fluorochemicals, Surfactants and Inert Liquids.

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MINNESOTA MINING AND MANUFACTURING COMPANY

. . . WHERE RESEARCH IS THE KEY TO TOMORROW

3M COMPANY

CW PHOTO—DOUG KIRKLAND

Hanovia's Ralph Hopper shows experimental gold-plated plastic, glass and steel items.

Making a Strike in New Gold Organics

New compounds are opening up broader industrial and military markets for gold and other precious-metal plating. Gold alkyl mercaptides, which decompose at lower temperatures than compounds previously used in "thermal plating," are now bringing the corrosion- and temperature-resistance of gold to plastics and metals as well as conventional ceramics and glass.

The newcomers, developed at Hanovia Liquid Gold Division (East Newark, N.J.), are gold tertiary butyl, tertiary dodecyl, tertiary octyl and tertiary hexadecyl mercaptides. In various formulations, they're being used for either decorative or utilitarian plating. Gold plate provides heat-reflecting protection for plastic laminates (e.g., jet-plane drag-chute containers, Atlas missile blast shields), for stainless steel (in aircraft honeycomb structures) and for aluminum, magnesium and titanium (jet-engine shrouds). It's also being used more to beautify structural materials (*CW, March 19, p. 86*).

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CW PHOTO DOUG KIRKLAND

Dissolving gold in aqua regia is first step to metallo-organics.

Applied as a coating, using silk screen, roller, or other techniques, the compounds are heated to 400-500 F to decompose organic matter, form a continuous metallic film. Conventional platers, such as metal resinates, require 750-800 F, limiting their use to ceramics and glassware.

New Hanovia research is aimed at finding compounds that require even lower decomposition temperatures. This research is indicated by Hanovia's recent Australian patent application 46,330/59, covering some of its work with gold tertiary mercaptides.

Hanovia Vice-President Ralph Hopper tells CHEMICAL WEEK the objective is to find compounds that can be used on such low-melting plastics as polyethylene and polypropylene, thus get more gold and other precious-metal plating into the package-labeling field.

Concomitantly, heating techniques are being developed to decompose the coating without hurting the substrate. With the new compounds, using infrared heating, gold plate can be produced on a variety of surfaces in as little as 15 minutes, says Hopper.

Du Pont, the other leading rare metallo-organic producer, says it is also working on low-temperature plating compounds, but gives no details.

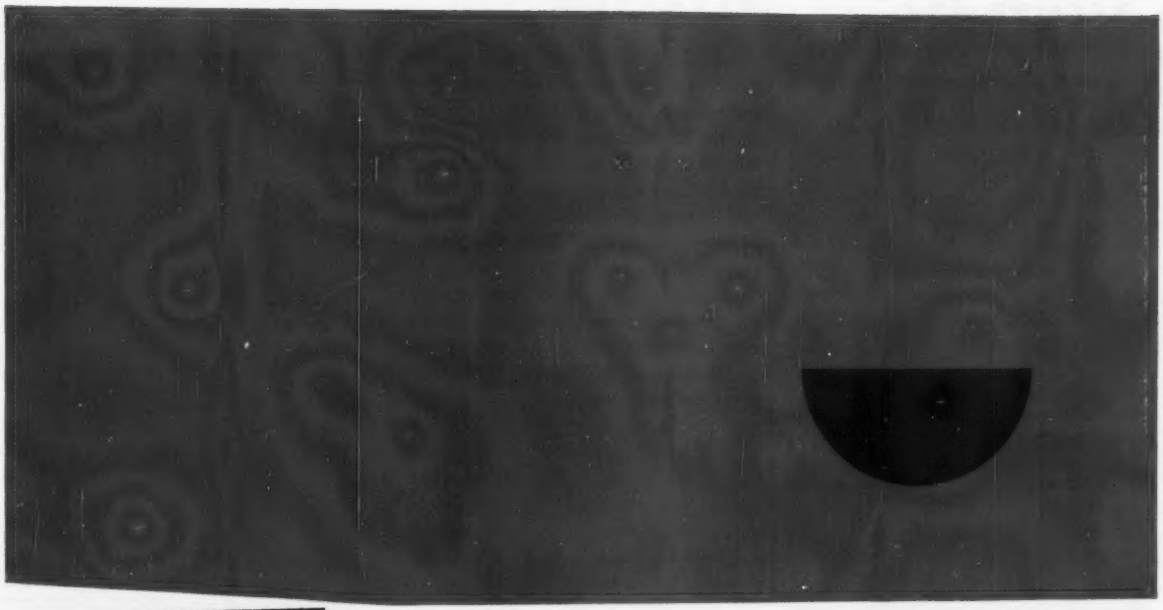
Both Du Pont and Hanovia are chary about pegging the market for the rare metallo-organics. However, it's know to be in the "multimillion-dollar" class. That's just a small segment of the $500-million metal-organics business, which is dominated by tetraethyl lead. But besides having a more specialized market, the gold organics are more specialized compounds—whereas the lead in TEL is bonded to carbon directly, the gold is linked to carbon through a sulfur atom.

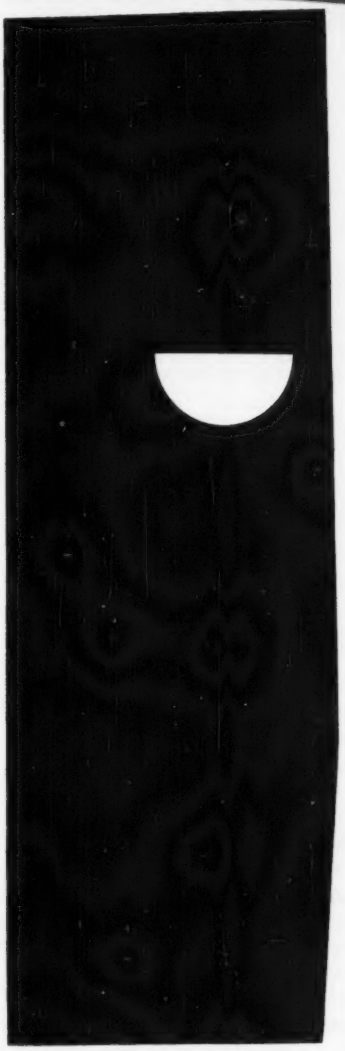
There is another common category of organometallics: coordination compounds (chelates such as chlorophyll).

Precision Platers: One advantage the rare metallo-organics provide that other forms of plating don't is precision placement of the metal film. This means that printing, decoration and the like can be accomplished with little waste of material. This is a significant point, since the films are relatively costly: golds cost about 10¢ per micro-inch of film thickness per square foot of completely coated area; platinum costs about twice as much. Thicknesses from 1-10 micro-inches are possible.

Besides its work on new compounds, Hanovia is researching new alloys in plating. One current problem is finding a decorative platinum-palladium alloy (deposited as a metallo-organic mixture) that won't volatilize at the temperature (1150 C) and time (4-5 hours) required to prepare Corning's glass-ceramic hybrid, Pyroceram. The metallo-organic must be applied before Pyroceram is given final heating to eliminate an extra heating step.

Alloying is also important in raising the heat-reflecting property of





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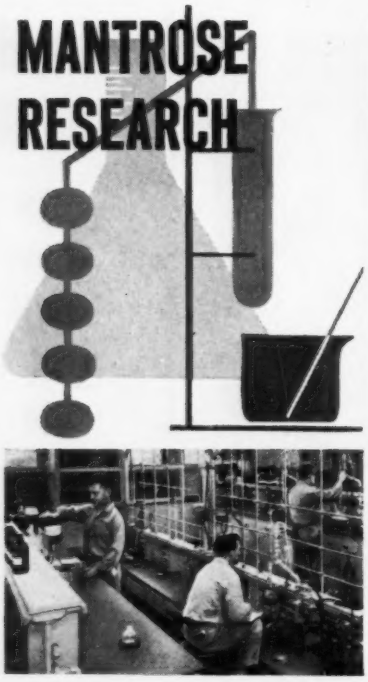

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films. Gold-palladium and -platinum films, for example, are superior to gold alone for reflecting infrared rays in the 2-5-micron-wave length range. Electrical properties, too, receive attention, since precious-metal films are widely used by electronic and electrical firms in making conductors, capacitors, resistors, etc.

Besides vying with conventional electroplating, metallo-organic plating competes with plating by use of colloidal metal suspensions (like the true compounds, these plate when heated, and the suspending medium is destroyed), plating by ionic displacement (a version of electroplating that requires no electrodes) and vacuum metallizing. Nevertheless, because of their new-found versatility, metallo-organics seem surely pointed toward larger markets.

Shrinkable Polyolefin

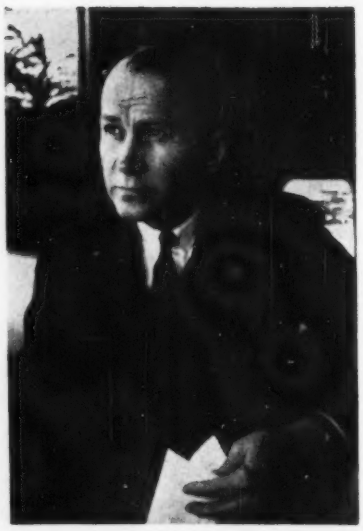
The first irradiated polyethylene packaging film has been developed and proved out commercially by W. R. Grace & Co.'s Cryovac Division (Cambridge, Mass.).

Its new film features high strength, clarity and the unusual property of shrinkability (*CW Technology Newsletter, March 19*). The starting resin may be any polyolefin; high- and low-density polyethylenes are currently being used, and the company expresses high interest in polypropylene.

The new material (called Cryovac L) differs from the firm's familiar saran-base Cryovac film in that the polyethylene product is less expensive, permeable to oxygen and very clear. These qualities make it attractive as a packaging material for frankfurters and other nonfrozen meats, fruits and vegetables, baked goods, and irregularly shaped items such as window shades.

Key to the new product is a closely guarded process of biaxially stretching a narrow web of irradiated material. The product of this step is a film that can be easily printed upon, processed on conventional machines, heat-sealed in a wide temperature range (300-500 F), and finally shrunk to the contours of the packaged item by heating quickly to 180 F or above.

The company reports that extensive test-marketing has proved out the product, that it's already in commercial use.



Gavin cites ADL's plans: more expansion, nongovernment contracting.

Gavin Pegs ADL Aims

A twofold plan for the future of Arthur D. Little, Inc., the Cambridge, Mass.-based research and engineering firm, is in preparation this week by James Gavin, newly named president of the 79-year-old company.

In an interview with CHEMICAL WEEK, Gavin outlined his aims on the direction of ADL's operations: first goal is continuous expansion in the U.S. and abroad, following the example of Gavin's predecessor, Raymond Stevens. Second aim is heavy reliance on nongovernment contract work, as called for by Gavin when he resigned as Army research and development chief to become an ADL vice-president (*CW, Jan. 24, '59, p. 32*).

Spreading Out: The importance of spreading the company's operations overseas is pointed up by Gavin's observation that there's a strong trend toward a Western nations' "common market," which may become a reality within the next 10-15 years. "We have definite plans to continue expansion outside the U.S., both in this hemisphere and overseas," he said, but didn't specify where this would be.

The company's domestic business is expected to keep pace with the growing national research budget, now pegged at $12 billion; but Gavin estimates it will hit $20 billion within a few years.

Cryogenics will remain one of

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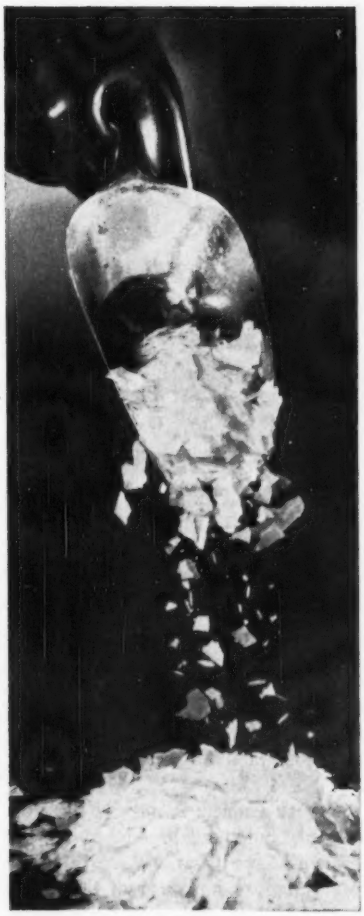

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RESEARCH

ADL's bread-and-butter fields of specialization, with several new applications expected to result from the Gifford-McGagon refrigeration cycle, disclosed last fall. Gavin also predicts more contributions by ADL to high-temperature research techniques, with initial emphasis on applications for the ADL-Strong arc-imaging furnace.

Private Sponsors: Gavin has long believed that space-age technology could benefit private industry in non-military applications. He plans to fit ADL's program to this objective by limiting the firm's government-sponsored work to one-quarter to one-third of its total effort.

Gavin affirms that the time has come for industry to take government-sponsored work—and add the extra effort required to develop new commercial products.

PRODUCTS

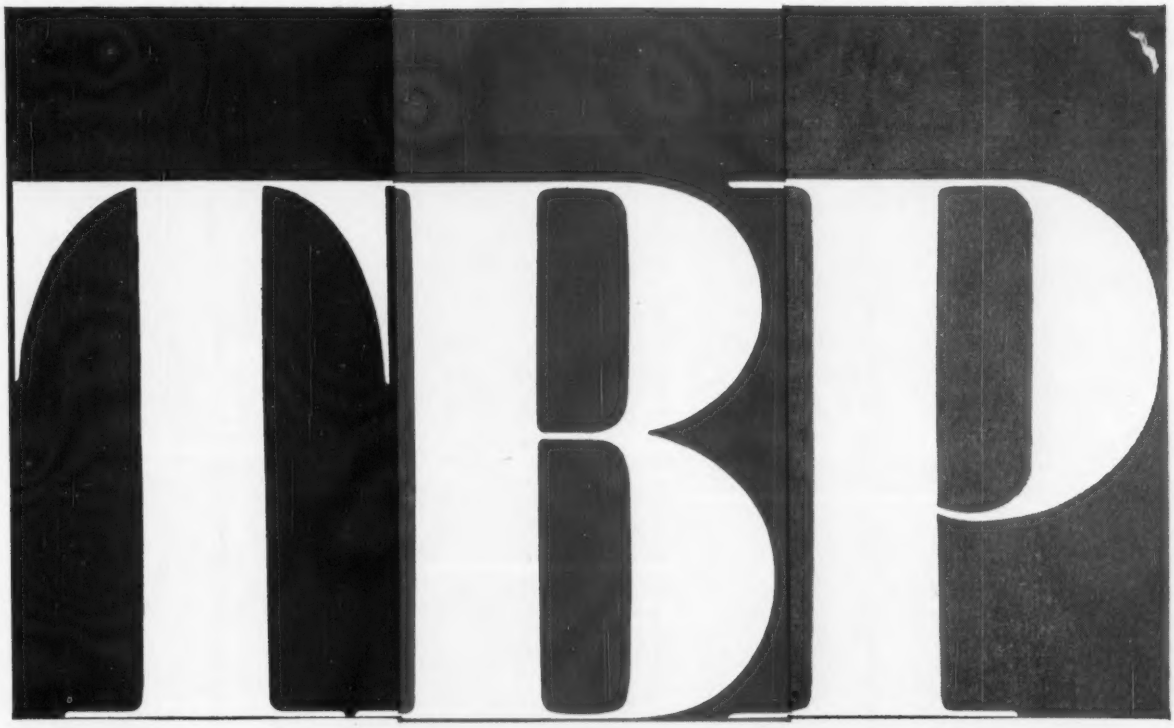
Safe Stabilizers: Three new vinyl stabilizers, classified as nontoxic by the Food & Drug Administration, are offered by Argus Chemical Corp. (633 Court St., Brooklyn 31). All three are nonliquid stabilizers that do not require addition of epoxidized oils, thus won't interfere with the physical properties of the stabilized resin. They reportedly can be used with lower-molecular-weight resins, and permit lower processing temperatures than are feasible with current nontoxic stabilizers. The three new products are called Mark 33 (featuring long-term effectiveness), Mark 34 (imparting high clarity) and Mark 35 (offering a combination of these properties).

•

French-Tagged: A number of C-14-labeled compounds produced by the French Commissariat de l'Energie Atomique are now carried in regular stock by New England Nuclear Corp. (575 Albany St., Boston 18). Among them: DL-glutamic-1-C^{14} acid ($400/-mc.); indole-2-$C^{14}$ ($450/mc.).

•

Fluoroaromatics: Pierce Chemical Co. (Rockford, Ill.) is making available 90 fluorinated aromatic compounds, including 40 derivatives of benzotrifluoride (many of which are said to be new). Available in research and pilot-plant quantities, these compounds can be used in organic synthesis for the introduction of fluoroaromatic and trifluoromethyl groups.



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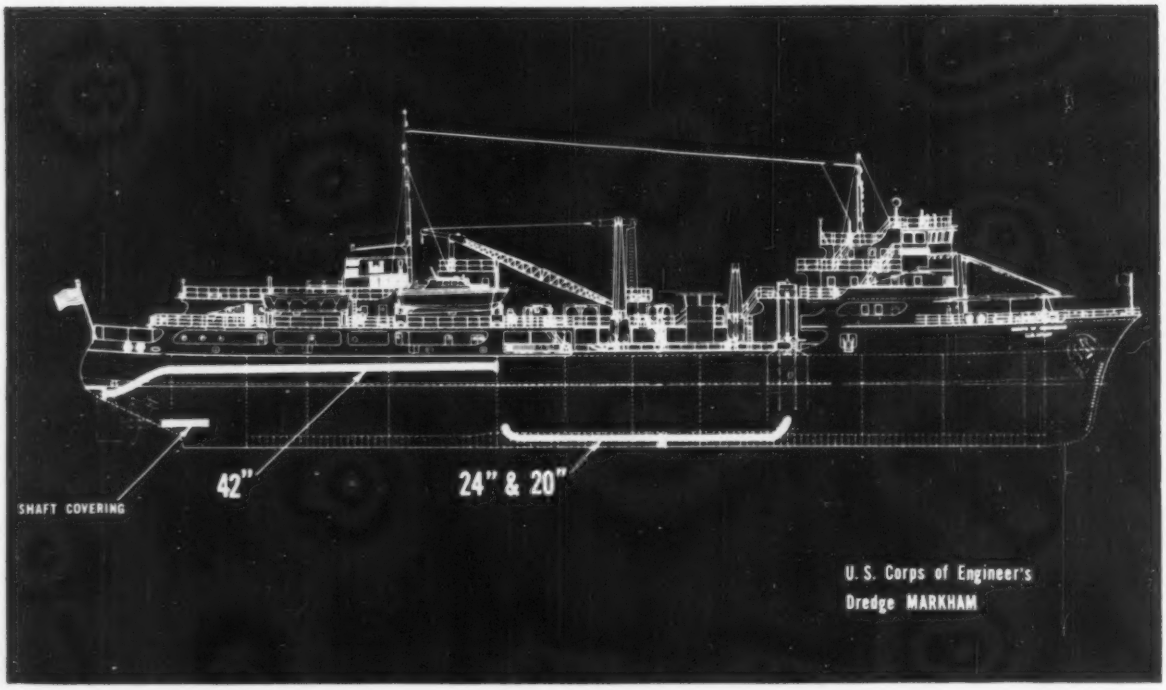


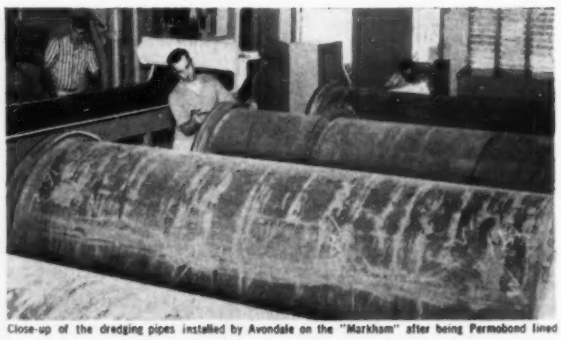
U. S. PERMOBOND SERVICE BY AVONDALE FOR U. S. ARMY ENGINEERS

"protects against abrasion, oil, elements"

The newly opened St. Lawrence Seaway, most dramatic marine development since the Panama Canal, is to be kept clear by dredges such as the one shown above. Operated by the U. S. Army Engineers, the dredge "Markham" uses Permobond to line its 42" diameter pipes and protect the main propeller shafts.

Permobond® protects the dredging pipes against abrasive action and oil. Permobond also eliminates corrosion from the main shafts when the dredge is working in salt water. The result is longer pipe and shaft life, very little maintenance, and maximum efficiency. The dredge builder (Avondale Marine Ways, Inc., New Orleans) selected and applied Permobond because of its known superiority to any other type of lining.

Because Permobond is unusually resistant to most corrosive chemical and abrasive conditions and can be applied to both new and existing equipment, many chemical manufacturing and processing corporations have already taken advantage of Permobond service protection for equipment



Close-up of the dredging pipes installed by Avondale on the "Markham" after being Permobond lined

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Technology
Newsletter

CHEMICAL WEEK
March 26, 1960

Heat-resistant, polyurethane-base coatings for missile components and launching pads have been developed by Dyna-Therm Chemical Corp. (Culver City, Calif.). Coated materials are said to be protected against heat damage at temperatures as high as 6000 F for one minute/50 mils of coating thickness. One gallon is sufficient to provide a 50-mil coating on 300 sq. ft. of surface, costs about $100. Coating is flexible, can be applied to components, such as cables, which are difficult to protect. Previously, only rigid graphite was suitable for protection at these temperatures.

Swedlow Inc. (Los Angeles), a missile supplier, gave Dyna-Therm an initial order for $585,000, will act as exclusive sales agent for the coating in Canada and the U.S.

•

Elemental sulfur will be recovered from waste hydrogen sulfide at Transcontinental Gas Pipe Line Corp.'s natural-gas processing plant in Tilden, Tex. The sulfide-removal unit has been in operation since mid-'58, stripping both hydrogen sulfide and carbon dioxide from 66 million cu. ft./day of natural gas, and burning the off-gas in flares. Sulfur recovery will be handled by Trans-Jeff Chemical Corp.—a newly formed joint subsidiary of Tranco and Jefferson Lake Sulphur Co. Process details haven't been disclosed.

•

Plans to put a new reactive acrylic latex into full-scale production on April 1 were revealed this week by B. F. Goodrich Chemical Co. (Cleveland). The new product—tradenamed Hycar 2671—has been sold in development quantities (as Hycar 260 X 67) for several months, appears to have solved many of the problems commonly encountered in textile applications of acrylic latex binders.

Chief advantages to textile processors: simplified compounding, reduced processing costs, increased coating stability. Unlike previous acrylic latexes, which required the addition of thermosetting resins to improve durability in washing and drycleaning, Hycar 2671 requires no additives, eliminates problems of short potlife and chlorine retention caused by inclusion of thermosetting resins. Cost of the new material: about the same as present acrylics plus additives.

Promising textile uses include: backings for upholstery and drapery fabrics; binders for nonwoven fabrics; adhesives or laminating agents. Test quantities of Hycar 2671 have been used successfully, says Goodrich, in making stitchless hems, seams and zipper installations. The company also foresees uses in paper-treating and leather-finishing.

•

Canadian pilot-plant work on *cis*-1:4 polybutadiene is near payoff; Polymer Corp. (Sarnia, Ontario) will begin production of the so-called "natural-synthetic" rubber shortly. It is already being produced at Polymer's

new pilot plant, which was designed for development work with stereospecific (Ziegler-type) catalyst systems. Phillips, in the U.S., is currently making the *cis*-1:4 polybutadiene in a 100,000-lbs./year plant at Borger, Tex., and plans to boost its capacity to 20,000 l.t./year (*CW Business Newsletter, Dec. 19*).

•

Experimental production of coke from noncoking, subbituminous coal is slated to start up late this year at Kemmerer, Wyo. The project will be operated jointly by Food Machinery and Chemical Corp. and U.S. Steel.

FMC, which developed and piloted the process, had previously disclosed plans for a $3.5-million, 250-tons/day plant to supply coke in sufficient quantity for production-scale tests at its Pocatello, Ida., phosphorus plant (*CW, Jan. 16, p. 40*). As a result of the joint venture, the new plant will also supply coke to USS for evaluation in its blast furnace operations at Provo, Utah. The Kemmerer plant will be engineered and constructed by United Engineers and Constructors (Philadelphia).

•

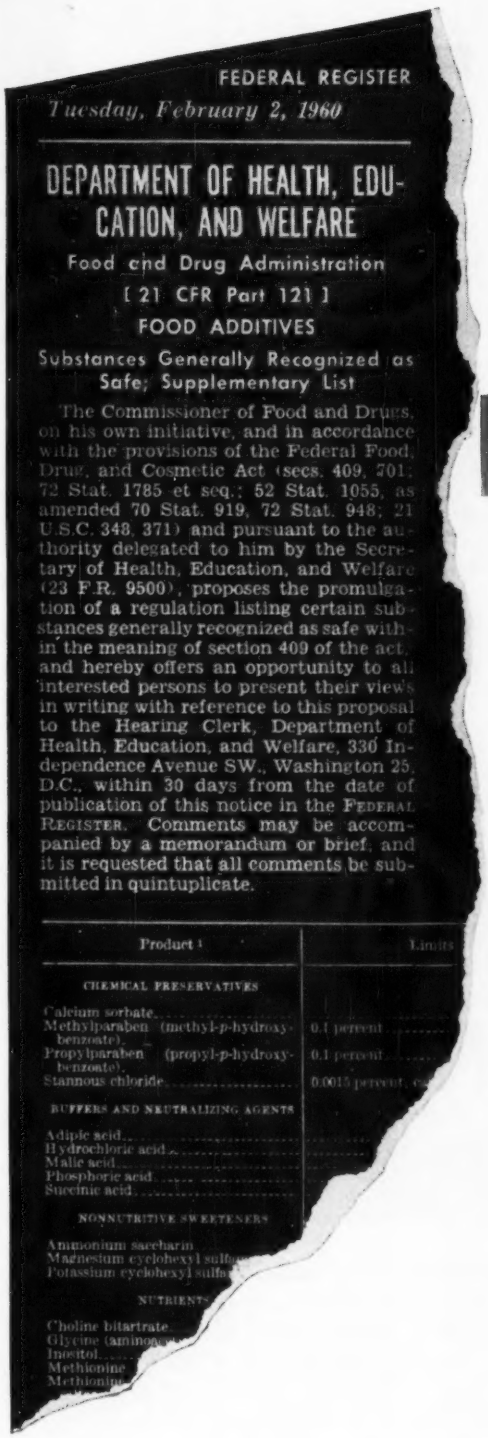
Westinghouse unveiled a novel magnetohydrodynamic (MHD) generator last week. It's the first such system powered by the combustion of conventional fuel. Unlike earlier MHD generators, which utilize an electric arc to produce the electrically conductive gas plasma (*CW Technology Newsletter, Nov. 7, '59, p. 70*), Westinghouse's unit burns furnace oil with oxygen to produce high-temperature (500 F) gas. Potassium soap contained in the fuel is ionized at this temperature to provide free electrons. As the hot gases speed through a water-cooled, refractory-lined tube, a magnetic field at right angles to the line of flow deflects the electrons to graphite electrodes, which conduct the electric current to an external load.

To date, a 10-kw. lab generator has made test runs of up to four minutes' continuous operation at power output levels to 2.5 kw. Shorter runs at levels to 5 kw. have also been made; but heat damage to the refractory lining materials as operating levels increase is currently a limiting factor.

In another area of power generation direct from heat, Westinghouse disclosed that it is "nearing completion" of a 5,000-watt thermoelectric generator for the Navy for prototype shipboard installation. And the company's final goal in this program, said Engineering Vice-President J. A. Hutcheson, is a 1,000-kilowatt power plant in the mid-'60s.

•

A new vaccine to combat cattle foot-and-mouth disease has been developed at the British Foot-and-Mouth Disease Research Institute (London). It's been tried out in Thailand and Africa under the auspices of the U.N. Food and Agricultural Organization, looks "reasonably promising," according to the institute's secretary, Colin Edwards.



FEDERAL REGISTER

Tuesday, February 2, 1960

DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE

Food and Drug Administration

[21 CFR Part 121]

FOOD ADDITIVES

Substances Generally Recognized as Safe; Supplementary List

The Commissioner of Food and Drugs, on his own initiative, and in accordance with the provisions of the Federal Food, Drug, and Cosmetic Act (secs. 409, 701; 72 Stat. 1785 et seq.; 52 Stat. 1055, as amended 70 Stat. 919, 72 Stat. 948; 21 U.S.C. 348, 371) and pursuant to the authority delegated to him by the Secretary of Health, Education, and Welfare (23 F.R. 9500), proposes the promulgation of a regulation listing certain substances generally recognized as safe within the meaning of section 409 of the act, and hereby offers an opportunity to all interested persons to present their views in writing with reference to this proposal to the Hearing Clerk, Department of Health, Education, and Welfare, 330 Independence Avenue SW., Washington 25, D.C., within 30 days from the date of publication of this notice in the FEDERAL REGISTER. Comments may be accompanied by a memorandum or brief, and it is requested that all comments be submitted in quintuplicate.

Product	Limits
CHEMICAL PRESERVATIVES	
Calcium sorbate	
Methylparaben (methyl-p-hydroxybenzoate)	0.1 percent
Propylparaben (propyl-p-hydroxybenzoate)	0.1 percent
Stannous chloride	0.0015 percent, ca
BUFFERS AND NEUTRALIZING AGENTS	
Adipic acid	
Hydrochloric acid	
Malic acid	
Phosphoric acid	
Succinic acid	
NONNUTRITIVE SWEETENERS	
Ammonium saccharin	
Magnesium cyclohexyl sulfa	
Potassium cyclohexyl sulfa	
NUTRIENTS	
Choline bitartrate	
Glycine (aminoa	
Inositol	
Methionine	
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1. Methyl and propyl p-hydroxybenzoate (Methylparaben and Propylparaben) are listed in a Food and Drug Administration order as substances for which prior sanctions have been granted as antimycotics for use in food-packaging materials, when used in accordance with good manufacturing practice. No limit or restriction is listed. (Federal Register, February 2, 1960)

2. Methyl and propyl p-hydroxybenzoate are listed in a Food and Drug Administration proposed regulation as substances generally recognized as safe for use as *chemical preservatives* in foods, with a limit of 0.1% for each, when used in accordance with good manufacturing practice. (Federal Register, February 2, 1960)

1959

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$iPr_2NCH_2CH_2$ —	(DIC*)
$Me_2NCH_2CH_2CH_2$ —	(DMPC*)
$Et_2NCH_2CH_2CH_2$ —	(DEPC*)
$Me_2NCH_2CH(CH_3)CH_2$ —	(DMMPC*)
$Me_2NCH_2CH(CH_3)$ —	(DMIC*)

*Michigan Chemical product names for the chloride hydrochloride form of R. All commercially available.

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$$R_3N + RCl \longrightarrow RR_3N^+Cl^-$$

Alkylation of alcohols and acids:

$$ROH \xrightarrow[2.\ RCl]{1.\ Na} ROR$$
$$RCO_2H + RCl \xrightarrow{base} RCO_2R$$

Alkylation of active methylene groups:

$$CH_2 \xrightarrow[2.\ RCl]{1.\ Na + alcohol} CHR$$

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Why Fluor Took Pains to Tell Its Troubles

At its annual meeting in Los Angeles last week, Fluor Corp., Ltd., revealed a loss of $229,278—against net sales of $15.6 million—for the first quarter of fiscal '60, ended Jan. 31. But the news caused little flurry among owners and even less among stockmarket savants. Reason: the week before, Fluor had given security analysts—and via the latter, shareowners—a preview of the firm's troubles.

In a move unusual for any firm, Fluor had invited security analysts to hear frankly how bad its business is. To analysts it was a rare but welcome maneuver, and subsequent results indicate management made points in its favor by choosing the course.

Purpose of the meetings, Executive Vice-President Robert Fluor told CHEMICAL WEEK, was to let stockholders know what they can expect of the company in the next several months, and to help avoid wild gyrations of the company's stock. Fluor told CHEMICAL WEEK that it had had trouble last May when rumors about its saline-conversion work forced violent movements in the stock's value, to the consternation and displeasure of a number of stockholders. Fluor points out that its stock is particularly sensitive to such things because only a limited supply is freely available for trading.

Ways and Means: Fluor arranged two luncheons on succeeding days, to which it invited selected groups of analysts known to have specific responsibility for keeping track of Fluor stock. About 30 people attended each luncheon.

Robert Fluor made the presentations, taking about a half-hour to outline the company's present position and expectations. The remainder of the two-hour period was open for questions from the floor. Analysts' reactions: "refreshing candor," "useful information." A number agreed that the mere issuance of invitations accomplished a good bit by drawing attention to Fluor's business results and the purpose of the meetings.

The Bad News: In the talks, Fluor reviewed results of '59 in which the firm posted a net loss of $885,821 on consolidated net sales of $109.9 million. Moreover, Robert Fluor cited earlier company predictions that in the first quarter of the '60 fiscal year the company would lose more than $125,000. Actual figures couldn't be revealed until the annual meeting a week later.

Mainly, Fluor said, the factors that made fiscal '59 a poor year will still exist through at least the first half of the '60 fiscal year, though he hopes to be "able to reverse this trend by the third quarter." In the oil refinery field, he said, few companies are now planning to build whole refining units. Oil companies have been adversely affected by general slowdowns and by lower octane ratings in new car gasolines. In manufacturing operations — the company has a wood laminating operation—it is not profiting but hopes to reach a breakeven point by the end of the year.

The company is pioneering a new concept of "package" selling of electrical power plants in the utility field. Under it, power companies would buy both engineering and construction in the same deal — from his firm, Fluor hopes — instead of contracting for each separately as has been the practice in the past.

In the field of helium extraction, Fluor said, the company is in a good position to obtain more contracts for plant engineering and construction work, because of its experience in building a previous plant. The Bureau of Mines and the Interior Dept., incidentally, are sponsoring a bill in Congress providing for construction, either by industry or the government, of 12 more such plants in the Texas-Oklahoma panhandle (*CW Market Newsletter, March 19*). Moreover, the bill would encourage more helium exploitation by allowing private industry to operate extraction plants, usually reserved to government.

The short-range outlook for the company, Fluor said, is not encouraging. In spite of an order backlog of $55 million, bidding on new ventures isn't picking up. Nevertheless, he believes, after first-half '60 the company will be moving forward again. Main aim right now: to work out a better-balanced workload, concentrate on package jobs of both engineering and construction in the oil, chemical and petrochemical fields. Fluor hopes that when this is accomplished the good news will draw as much attention as the bad news did.

Upshot: Security analysts thought that Fluor's effort was sound. But they warned that a company shouldn't try this gambit unless it's willing to be wholly frank. All agreed that such efforts — properly executed — would bolster shareowners' confidence in management.

Fluor's Robert Fluor answers questions for security analysts.

LEGAL

Shell Suits: Three separate suits totaling $217,345 have been filed against the Shell Chemical Corp. and a distributor, Emilio D. Cuevas, in superior court at Phoenix, Ariz. Three cotton growers, each with 80 acres, allege that liquid fertilizer damaged 240 acres of cotton. Suits are for $76,500, $73,500 and $67,345, respectively, by farmers near Tonapah, Avondale and Buckeye.

•

Chlorine Quiz: A New York state inquiry into the pricing practices of chlorine suppliers ended last week at Binghamton after four days of testimony. Assistant State Attorney General Emeel Batros, who directed the inquiry, has refused to comment on results of the probe or what the next step in it would be. The investigation started after the mayor of Binghamton said that prices quoted to the city by competitive bidding firms have been identical to the last decimal point for several years. Thirteen firms are under investigation.

LABOR

Esso Victory: Esso Standard Oil employees at Bayway, N.J., favored their independent union by a 52-vote margin, 699 to 647, in a runoff election between Independent Petroleum Workers Union and Oil, Chemical & Atomic Workers.

Election of IPWU indicates that drives by OCAW to unseat independent unions at oil refineries are not working as well as it had hoped. Independents have recently won two out of three elections in the Esso network.

Esso's contract with IPWU expired the night of the election; presumably contract negotiations will start immediately after NLRB certification of the election results.

•

Du Pont Victory: For the sixth time in 12 years, union forces have failed to breach the walls of Du Pont's chemical redoubt at Belle, W. Va. This time the losers were Oil, Chemical & Atomic Workers Union and District 50, United Mine Workers.

Some 97% of the plant's 2,100 production and maintenance employees turned out to vote. Results: No union, 1,412; OCAW, 500; UMW, 76. A total of 2,008 votes were cast and 1,988 ruled valid.

Significantly, UMW, in the heart of its strongest bailiwick, pulled only 3.8% of the votes, an indication of the hard organizing road ahead of it, now that it's free to seek National Labor Relations Board certification under the new Landrum-Griffin Labor Act. UMW was the last union to represent Belle employees, was ejected in '48 after bitter strife.

Also significant, the Belle Works has been at the head of OCAW's prime chemical targets list, under its new centralized organizing setup. But OCAW drew only 25% of the votes. Apparently, the union miscalculated its position, basing its hopes on near victory last year, when it missed by only 40 votes, a situation that most observers say was due to heavy layoffs. Belle was also the first '60 target in an intensive drive to organize Kanawha Valley plants, including Carbide's South Charleston and Institute facilities. Last year the Institute plant workers also turned down OCAW.

•

Carbide Onslaught: At Union Carbide's Texas City plant, Local 10, Process and Control Engineers Union, has petitioned for an election to determine whether it can replace Local 711, Texas City Metal Trades Council, AFL-CIO, as agent for 1,900 workers. NLRB has set April 12 as the election date.

•

Refinery Setback: At the Sugar Creek, Mo., refinery of Indiana Standard Oil Co., Local 5-672, Oil, Chemical & Atomic Workers Union, has capitulated in its eight-month strike by voting, 199-144, to return to work "unconditionally." Work rules have been the center of strike controversy and, until agreement on a new contract is reached, union members will be working under terms of management's latest contract proposals "with certain exceptions." OCAW represented 760 operating and maintenance personnel when the strike started; a total of 343 employees voted in the recent election.

•

Canadian Strike: Pickets have been set up outside the main gate of Cyanamid of Canada's Niagara Falls, Ont., plant by striking electricians in Welland, Lincoln and part of Haldimand counties. Local 303, International Brotherhood of Electrical Workers, is asking for a wage increase of 25¢/hour, plus an additional 20¢/hour in fringe benefits. Current basic pay for electricians: $2.60/hour. Although the strike affects only contract electrical work, permanent electrical employees at Cyanamid are honoring the picket lines.

KEY CHANGES

James McWhirter to president and board of directors, **John O. Logan** to vice-president and board of directors, **W. C. Willits, W. A. LaLande, Jr., A. H. Clem, C. L. Williamson, J. G. Johns** and **J. L. Wood** all to board of directors, Penn-Olin Chemical Co., jointly owned subsidiary of Pennsalt Chemicals Corp. and Olin Mathieson Chemical Corp., (Calvert City, Ky.).

George J. Webster to president and general manager, United Carbon France S.A., French subsidiary of United Carbon Co. (Houston).

M. E. Colson and **E. J. Massaglia** to board of directors, Atlas Powder Co. (Wilmington, Del.).

H. L. Wampner to board of directors, **J. E. D'Angelo, W. O. Fetterly, E. F. Kelly** to vice-presidents, manufacturing, **R. H. Melinat** to vice-president, Pacific Southern Division, and **T. P. Shumaker** to vice-president, sales, Tuscaloosa Division, Reichhold Chemicals, Inc. (White Plains, N.Y.).

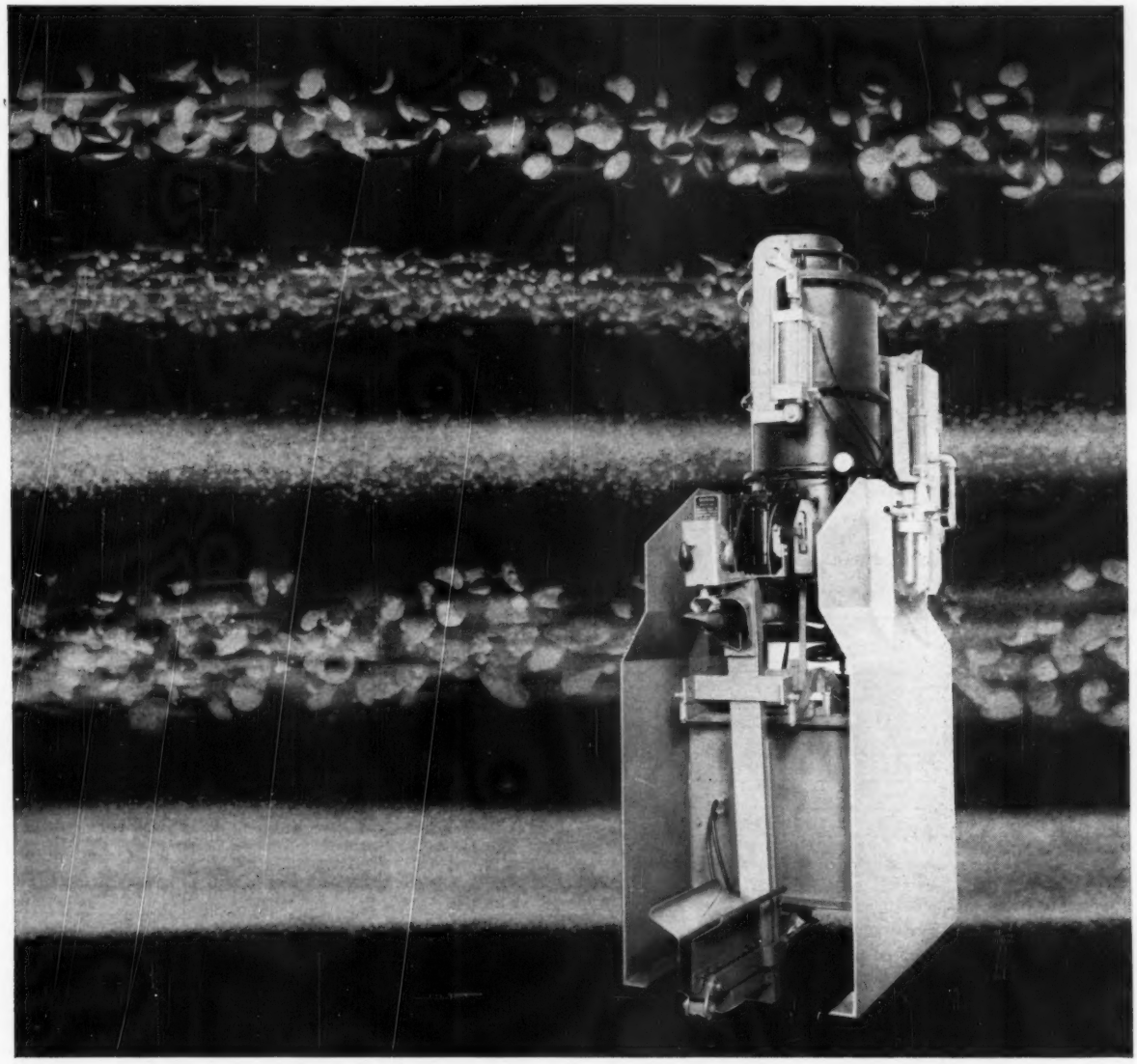
Robert M. Ulrich, Jr. to vice-president and board of directors, **A. O. Brookes** to treasurer, and **J. J. Denzler** to secretary, Nopco Chemical Co. (Newark, N.J.).

Jackson B. Browning to vice-president, Union Carbide Development Co., division of Union Carbide Corp. (New York).

W. H. Feinstone, D. C. Hallford, M. D. Plough and **L. J. Smith** to vice-presidents of scientific administration, industrial relations, administration and sales, respectively, Plough, Inc. (Memphis Tenn.).

James M. Williams to vice-president, Amsco Solvents and Chemicals Co. (Cincinnati).

Phillip Ritter III to vice-president, Wm. S. Merrell Co. (Cincinnati).



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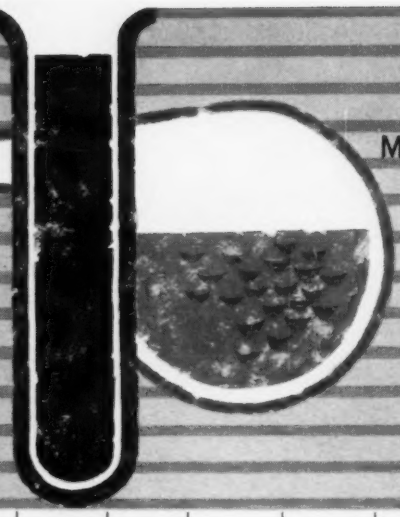

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Ammonium Citrate	✓	✓	✓	✓					
Gluconic Acid	✓	✓	✓	✓				✓	
Glucono Delta Lactone	✓	✓	✓	✓				✓	
Sodium Gluconate	✓	✓		✓				✓	
Oxalic Acid	✓	✓	✓	✓	✓		✓	✓	
Ammonium Oxalate	✓	✓		✓					
Ferric Ammonium Oxalate									✓
Tartaric Acid	✓		✓	✓				✓	
Tartar Emetic				✓					
Rochelle Salt			✓	✓					
Cream of Tartar	✓			✓					

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Nontoxic, mild, yet chemically active against scale and tarnish. Used extensively in the formulation of general metal cleaners and polishes, particularly household products.

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Ammonium Citrate...
Especially useful for the removal of rust in near neutral solutions. Extremely mild and safe to handle.

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An excellent sequesterant in alkaline derusting solutions; provides rust-free, clean surface ready for further treatment. Also highly effective in aluminum etching and paint stripping compounds.

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Used extensively in the production of light-fast gold colored aluminum.

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Increases efficiency and yields finer-grain deposit in alkaline copper plating.

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New Transportation Policy Hinges on These Commerce Dept. Proposals

- **Amend Interstate Commerce Act provisions on carrier permits.**
- **Retain restrictions on rail-truck mergers and acquisitions.**
- **Continue present user charge systems, set up where none exists.**
- **Amend national policy definition of 'unfair competitive practices.'**
- **Adoption by states of uniform regulations for highway vehicles.**

New Try at Untieing the Transport Tangle

This week, chemical process industries management is analyzing a just-released and long-awaited study of the nation's transportation system. It's too early to gauge CPI reaction to the analysis and its proposed changes (above) in U.S. transport practices—but it is clear that the changes suggested in the 32-page report could have a significant effect on chemical shipments.

The study—a year-long effort costing some $200,000—hits hard at the transportation system's lack of "economic balance"—which reflects the U.S.'s uncoordinated transport policies. It also proposes a 78-point program to restore the ailing industry to health and vigor.

Of major interest to CPI traffic managers is the proposal that existing user charges be maintained, that new user charges be established where none exist—on inland waterways, for example. But the report notes that such charges should start low, then scale upward over a period of years until all groups are paying their fair shares of operating and maintenance costs.

These user charges likely would be passed along to chemical shippers using the waterways, could hike their distribution costs somewhat.

Although the report points up the hazards of delaying corrective action, such action is likely to be somewhat distant. Several persons close to the report—including Columbia University Professor of Transportation Ernest W. Williams, Jr., who directed the study group—feel some of the recommendations might eventually find their way into legislation, but most government and industry observers see little likelihood of it this year. In any case, the report's greatest value is as a first step in the development of an effective, balanced federal transportation policy, say observers.

The Transport Mess: The special transportation study was launched in early '59 to try to "identify emerging transportation problems, redefine the federal government's role in transport matters, and recommend legislative and administrative actions to restore economic balance to the system."

Many business leaders feel that the hodgepodge of overlapping and conflicting federal activity in transportation (as a regulator, user, subsidizer) has retarded growth and constructive change at a time when the nation's bustling economy needs aggressive, imaginative transportation policies.

The report bears this out. "National transportation is presently out of balance," it states flatly. Total capacity is not geared to total needs, and economic regulation has been administered in rigid compartments instead of being broadly conceived, the study adds.

A basic premise on which the study was based reflects the growing concern with bigness in government: "Regulation exists to protect the public from the abuses of monopoly power; as competition grows in transportation, regulation should shrink."

Cutting Costs: Expressed in basic terms, the transport muddle is jacking up the cost of distribution, and the report is designed to show some way of cutting costs.

Dept. of Commerce officials see several benefits to American industry from reductions in the high cost of shipping. Among these advantages:

• Greater flexibility in choosing plant locations.

• Increased industrial efficiency, thus greater profits.

• Improved utilization of natural resources.

Operating Permits: The report favors changes in present federal policies regarding operating permits and certificates granted to carriers. For one thing, the study advocates granting operating rights mainly on the basis of the carrier's efficiency—as reflected in operating costs, quality of service. Moreover, the study advises gradual elimination of many operating restrictions that now limit carriers. Examples: limitations on type of service offered, commodities carried, routes covered.

However, the study favors retaining existing restrictions against rail-truck mergers unless they promise public advantages that outweigh possible reduction in competition that may result.

Focus on Ratemaking: Basic to a healthy transportation system, says the report, are rate structures that are in line with the carrier's costs. The study adds that rates should be based on cost studies and current market facts rather than on opportunistic and sporadic bids to take traffic from competing carriers.

In line with this view, the Commerce Dept. report recommends these changes in federal rate policy:

• Insure that rates are high enough to cover costs. Present standards for "reasonableness" of maximum rates would be retained.

• Amend rate suspension rules to require substantially more evidence before a rate can be suspended. Eventually, the report states, the entire rate suspension process should be eliminated.

• Alter the national transportation policy to define "unfair and destructive competitive practices" to include only rates below the long-run marginal costs of the carrier making the rates.

Checking Costs: Of course, before any realistic rates can be set, carriers must have an accurate picture of their cost structure. The report recommends several steps to clarify cost analysis procedures. Among them:

• A transportation census performed by the Bureau of the Census to determine operating costs, forecast future traffic volumes and patterns.

• Joint body of government agencies designed to work out more uniform accounting requirements.

• Installation of modern data-processing equipment by regulatory agencies to aid in cost analysis.

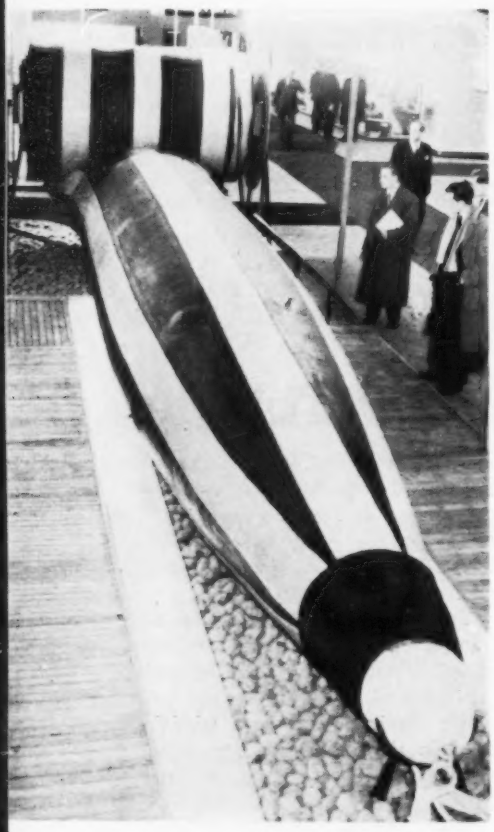
Forecast: Although the Commerce Dept. study was an ambitious one, it is hard to say what effect it will have—and any effect will be a long time coming.

Since World War II, many studies like this one have been greeted with near-apathy by Congress and state legislatures. Among the casualties: proposals, such as the one in the current report, that the various states adopt uniform regulations on sizes, weights and safety appliances for highway vehicles operating in interstate commerce.

Moreover, Williams tells CHEMICAL WEEK, there's little reason to hope for better treatment for this study.

"Of course, any changes that are made in the nation's transportation system probably should be gradual anyway," he added.

On the other hand, only 20 of the 78 recommendations require Congressional action; the rest conceivably could be implemented by administrative actions within regulatory bodies of the government. Even so, few transportation men foresee any immediate action.



Rubber 'Barge' on Roller

Production version of the Dracone—sausage-like, flexible, nylon-and-rubber device for carrying freight by water—was a hit at the Engineering Materials and Design Exhibition in London last week. Model shown was 100 ft. long, had 35-tons oil-carrying capacity. Similar Dracones already are in use in West Africa and the Far East, and others—200 ft. long, and with 320-ton capacity—are under development.

DATA DIGEST

• **New Epoxy Resins:** Three new epoxy resins, which are epoxidized polyolefins rather than condensation products of polyhydric phenols, are described in a 24-page booklet. The new resins are said to react in a number of novel ways because of their unique molecular structure. Thirteen tables and 10 graphs provide extensive data on physical properties, formulations, cure systems, exothermic characteristics, high-temperature properties and uses. Food Machinery and Chemical Corp. (161 East 42nd St., New York).

• **Ceramic Fiber:** New eight-page brochure presents property data on a ceramic fiber, claimed to withstand temperatures up to 2300 F. Suggested uses: missile parts, furnace insulations, linings for oil burners. The Carborundum Co. (Niagara Falls, N.Y.).

• **Polypropylene:** A new, 20-page booklet provides technical data on polypropylene. Numerous charts present detailed data and illustrations show successful applications. Hercules Powder Co. (Wilmington 99, Del.).

• **Sulfosuccinates:** New bulletin (212b) describes a series of dioctyl, dihexyl and diisobutyl sulfosuccinates available in liquid and powder form, and pharmaceutical grades of sodium and potassium salt of dioctyl sulfosuccinate. Mona Industries, Inc. (Paterson, N.J.).

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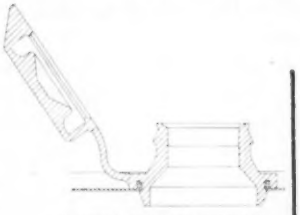

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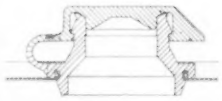

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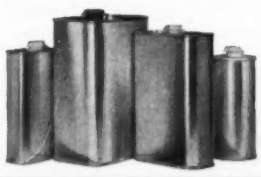

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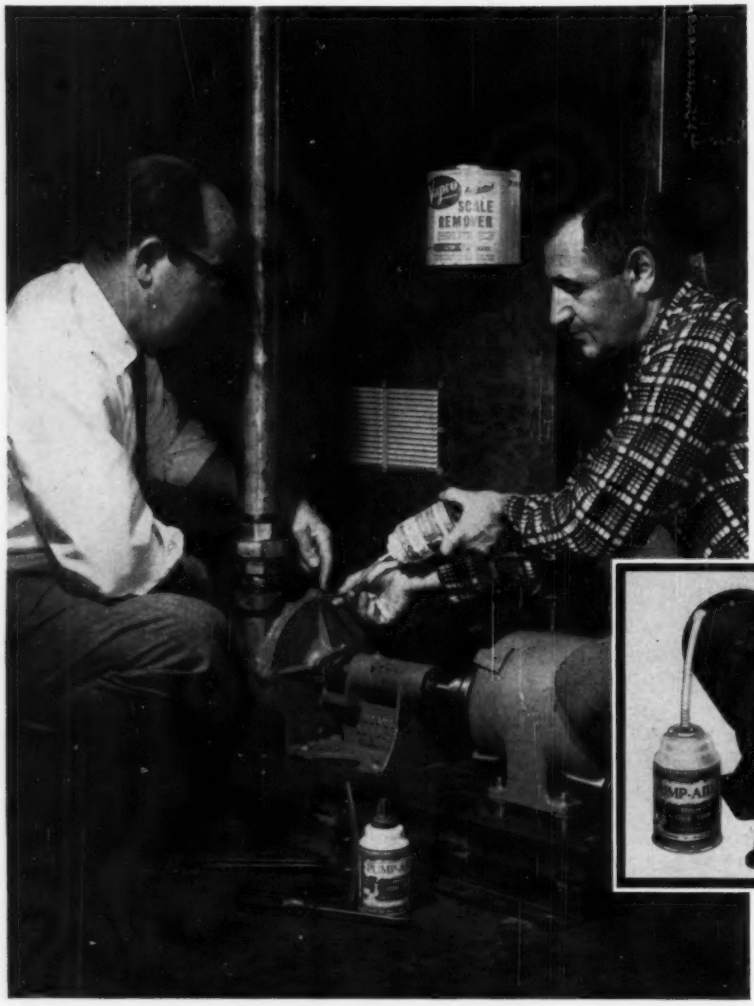
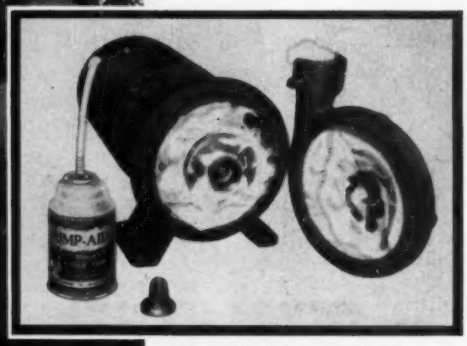


Pressure-packaged pump protector

stabilized with Carbopol



"Pump-Aid" for protecting air conditioning pumps and equipment is manufactured using Carbopol 934 by The Garman Company, St. Louis. B. F. Goodrich Chemical Company supplies the Carbopol 934.

When this protective foam is injected into pumps, it coats internal surfaces with a film that protects against corrosion during long down time periods. The film can be flushed out with water when it's time to put the pump back into operation. This oil and water emulsion is stabilized with Carbopol water-soluble resin before packaging in the aerosol can.

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Industrial engineer fills in for vacationing supervisor, helps trim supervisor's paper-work overload.

Solving Summertime Manpower Shortage

About this time of year, plant managers begin looking for ways to maintain plant efficiency in the absence of supervisors during summer vacation time. Now the industrial engineering department of Food Machinery and Chemical Corp.'s chemical divisions may have a solution of the problem—it not only adds summer supervisors but at the same time helps improve plant operation.

The plan: use industrial engineers as line supervisor substitutes. Some of FMC's plants have already tried it.

Ray Reul, coordinator of the chemical divisions' industrial engineering department, says the industrial engineer is a logical choice because, unless he is carrying out line duties at the time (e.g., incentive plan administration), his regular work is the type that can be put aside temporarily.

Gunnar Lucas, who heads industrial engineering at FMC's Carteret plant, tells how the plan started. "We began the program last year, not so much to help ease a manpower shortage as to help our industrial engineers familiarize themselves with plant operations. We wound up with a lot more than we expected."

In the departments in which they worked as replacement supervisors, the industrial engineers found enough industrial engineering work to keep them in the department for several weeks after the supervisor came back from vacation. In one case, when the supervisor returned, he and an industrial engineer were able to help cut one department's paper work.

An Education: The advantages to the industrial engineer are more in the nature of an "education," says Reul. "An industrial engineer tends to be ivory-towerish. But when he moves into a production job he gets an education—he has to get his feet back on the ground and produce."

The vacation fill-in plan should boost worker relations. Reul adds: "The IE is always associated with change. Now he gets a chance to see the headaches that go along with the changes he may have proposed."

But the plan must be administered with care. In the departments in which it was tried at Carteret last year, only industrial engineers with considerable experience in the plant were used. "Our supervisory replacements each had at least two years' experience before they were considered. We might pick less experienced men in the future, but we'll have to

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PRODUCTION

try it with care if we do," says Lucas.

As FMC works it, the replacement supervisor spends three days to one week with the foreman before taking over. His stint in charge of the department runs from two to four weeks. And, to help fill the gap in the industrial engineering department, the plant hired a college senior on summer vacation.

Stepping Stone: Lucas points out that the plan can work as a stepping stone for the industrial engineer: "His greatest opportunity for long-range advancement is probably in production rather than in industrial engineering. Experience as a supervisor can help a man get a permanent production assignment. The production supervisor who has had industrial engineering experience is that much better fitted for advancement."

Reul adds that plants considering the plan might also use industrial engineers as vacation replacements in other than line assignments—for example, as production schedulers, warehouse foremen, possibly even assistant maintenance foremen. They might also try moving personnel into industrial engineering departments while the "regulars" are out substituting. Of course, familiarization with the type of work is essential for any vacation replacement assignment.

But many chemical plants will find it impossible to use industrial engineers because they do not have such engineers on their staff. A survey by *Factory* magazine shows that industrial engineers are less plentiful in chemical plants than in other industries (*CW, Oct. 26, '57, p. 49*).

Other Measures: Some chemical plants upgrade a senior operator to fill in for a supervisor during vacation period, temporarily pay him a higher hourly rate. Both union and nonunion plants are using this system, which is often considered a good test for promotions.

"It shows a man both sides of the management - labor relationship," says one plant manager; "but in union plants, the move must be carefully defined in the contract. The upgraded man is crossing back-and-forth over a sharp line. As temporary supervisor, he represents management; but he must then move back to regular union status when he returns to his operator's job."

Rather than have potential union problems, juggle personnel or hire outsiders to fill in, some plants shut down for vacation. Although small plants often find this plan more convenient than do large plants, the move is usually dictated by a plant's business pattern. If inventories can be built up, or if customers shut their plants for vacation, a coinciding vacation shutdown is sometimes the best arrangement.

The variety of plans tried points up the complexities of the situation. Plainly, industrial engineers can't take the job on in every case. But the FMC plan points a way that other companies might well follow—for a short distance, at least.

EQUIPMENT

Selector Valves: Circle Seal Products Co. (2181 East Foothill Blvd., Pasadena, Calif.) has a new dual, four-port selector valve for use with chromatographic and other gas analyzers. The valve permits the use of one column in the system while the other is being purged or backflushed, and plugging of one port still permits valve operation on a three-way basis. Called Model P2-418, it comes in aluminum and 303 stainless steel, will operate at temperatures from —40 to 350 F.

•

Automatic Blender: Sturtevant Mill Co. (Dorchester, Boston 22) is making a new rotary blender and hopper on a movable bed. The device automatically blends materials coming from one process, introduces them directly nto the next. Between processing steps, a supplemental hopper holds materials to be mixed into the product. The entire blending process is controlled from a single panel. Units are available in ¼- to 200-tons capacities.

•

Shutoff Valve: Agavenco Inc's. (858 Scott St., Santa Clara, Calif.) new line of lightweight, corrosion-resistant shutoff valves has an aspirator system in the bypass port that, by reducing downstream line pressures, permits faster cutoff of liquid flow. The valves, for spray drying and sprinkling service, may be assembled and disassembled without removal from the piping system. They come in 1- and 2-in. sizes.

•

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•

Canned Pump: A new, canned centrifugal pump for leakproof handling of volatile, toxic and flammable liquids is available from Goulds Pumps, Inc. (203 Black Brook Rd., Seneca Falls, N. Y.). The pump cools its motor, lubricates moving parts by circulating a portion of the liquid being pumped through the hermetically sealed rotor housing and grooved bearings. A built-in thermal cutout protects the motor from overheating. The unit is recommended only for clear liquids, comes in two sizes (1-in. and 1¼-in. discharge), has capacities to 110 gal./minute, heads to 100 ft.

•

Ball Valves: Hills-McCanna Co. (4600 West Touhy Ave., Chicago 46) is out with a new line of ball valves said to provide full flow, tight shutoff, quick turnoff. Service temperature: to 350 F; pressures: to 700 psi. for the McCannaseal model, to 1,000 psi. for the McCannaflo model. The valves are available in a variety of metals; sizes: ¼ to 6 in., with screw and flange connections.

•

Drum-Filter Belt: The Eimco Corp. (P.O. Box 300, Salt Lake City 4) is out with a new flexible, nonwoven metallic belt for drum filters. The belt has individual, rigid, wedge-shaped bars that are close together during cake formation and drying, spread apart for easy cake discharge as belt passes around discharge roll. Belt may be replaced in sections if damaged.

•

Gas Turbine: An open cycle, single shaft 9,000-hp. gas turbine is a new offering of Clark Bros. Co. (Olean, N. Y.). Called Model 305-S, the turbine is compact, burns liquid or gaseous fuels, may be used as a power source for centrifugal compressors, power generators and liquid pumps.

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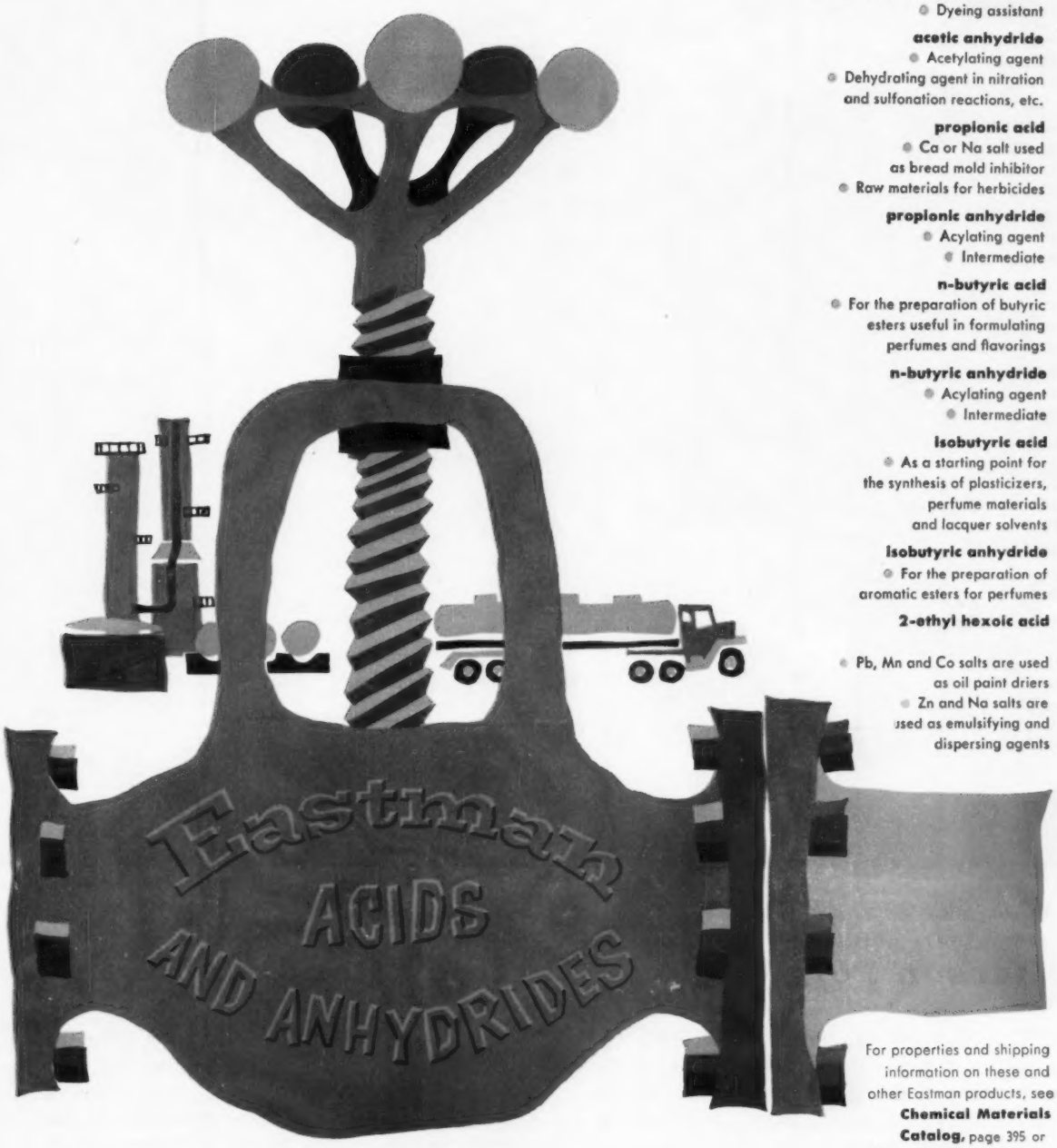

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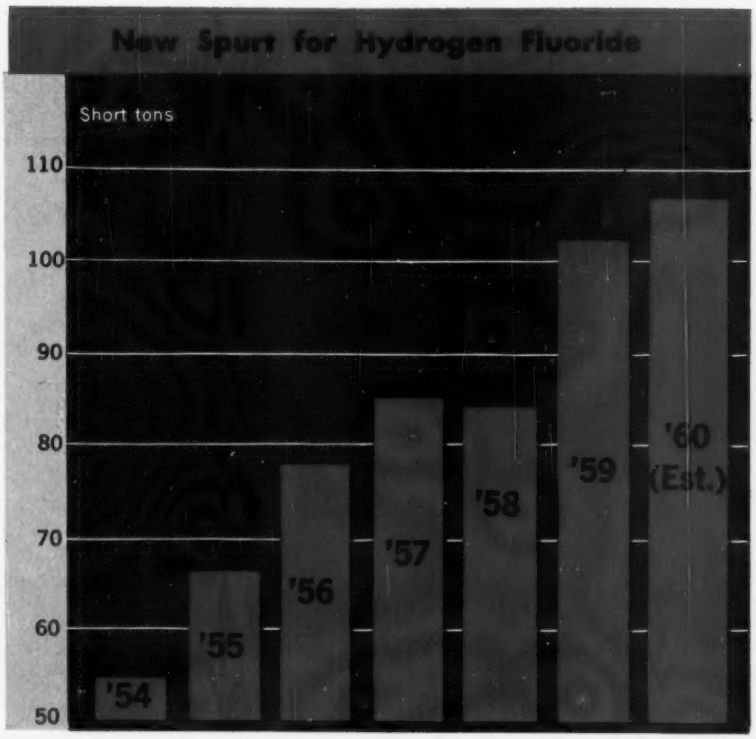


HF Capacity Hits New High

Heavy demand for hydrogen fluoride during '59 has stimulated a new round of capacity expansion. Only last week, Allied Chemical reported it would expand its facilities at Nitro, W.Va., by 50% (CW Business Newsletter, p. 18). At the same time, Dixon Chemical showed firm plans to enter the field as an HF producer in '61.

Allied's present Nitro plant is relatively new—it started operations at the beginning of '59. The current expansion work is now in progress, should be completed by the first of April. A large part of Nitro's output, according to trade sources, is used by Union Carbide in the production of its Ucon fluorocarbons.

The contract for Dixon's HF plant, at Paulsboro, N.J., has been let to Vulcan-Cincinnati, Inc. The unit will use a new Swiss process developed by Buss AG. (*CW, March 12, p. 43*). Construction is expected to start this summer, with completion slated for '61. Design capacity is in excess of 10,000 tons/year.

Reason for Dixon's entry into the field is twofold: (1) to sell some material on the open market; (2) to upgrade the HF into other fluorine products, such as fluorocarbon gases and inorganic salts, which is Dixon's ultimate aim.

On the upgrading venture, Dixon hasn't decided yet whether to go it alone or with another company. Most observers, however, believe it will take the latter course.

On the Upswing Again: Preliminary figures for '59 show HF production of 102,854 short tons, an increase of 22% over the '58 mark. This record output put HF back on the growth track that it had traveled throughout the '50s. In '51, for example, HF production (excluding that made by primary aluminum makers) totaled 43,660 s.t. When the industry closed out the decade in '59, production had more than doubled.

Behind the rapid growth was, of course, the breaking open of markets for fluorocarbon gases (used in aerosols and refrigerants), plus the increased demand by the government for HF to use in uranium processing. Also contributing was HF's increased use for petroleum alkylation.

Now, however, an old outlet appears to be headed for big growth: use of aluminum fluoride for production of primary aluminum. Of course, HF has been used in this application for many years, with aluminum manufacturers—Alcoa and Reynolds—having their own HF plants. And Allied's plant at Nichols, Calif., supplies Kaiser's West Coast operations.

Now, with aluminum output breaking records, producers will probably be using more HF made by chemical companies. In '59, output of primary aluminum topped 1.95 million s.t., 300,000 more than the record output of '57. During this period, Alcoa had to buy almost 10% of its aluminum fluoride needs from "outside" HF manufacturers.

And Ormet, a relatively young aluminum producer, will purchase all its aluminum fluoride, since it has no HF facilities. Ormet (owned jointly by Olin Mathieson and Revere Copper) is now buying the fluoride from OM's Blockson Chemical Division, which operates an HF unit at Joliet, Ill.

Thus, it appears likely that during the next few years a good share of the chemical industry's HF will find its way into the manufacture of aluminum fluoride. This prediction is, of course, based on the premise that aluminum producers will find it just as economical to purchase aluminum fluoride from HF manufacturers as to invest capital in expanding their own HF facilities.

The aluminum industry's need to buy fluorides has helped change the compilation of HF statistics. In the past, government figures have excluded HF used in making the aluminum fluoride and synthetic cryolite for primary aluminum production. For example, Allied's production at Nichols has not been included in past government figures. Now, however, it appears that '59's output record is partly an "accounting" record — attributable to the chemical industry's reporting HF consumption that had found its way into aluminum fluoride production. The Business & Defense Services Administration is now pre-

paring a questionnaire to clarify this situation.

Allowing the aluminum industry the biggest bite, fluorocarbon producers are the second-largest buyers of HF. Output in '59 for fluorocarbons increased 10% over '58. And outlook for the next few years is for continuing growth, not only in the field of aerosols and refrigerants but also in the newer, high-temperature fluorinated polymers currently being developed.

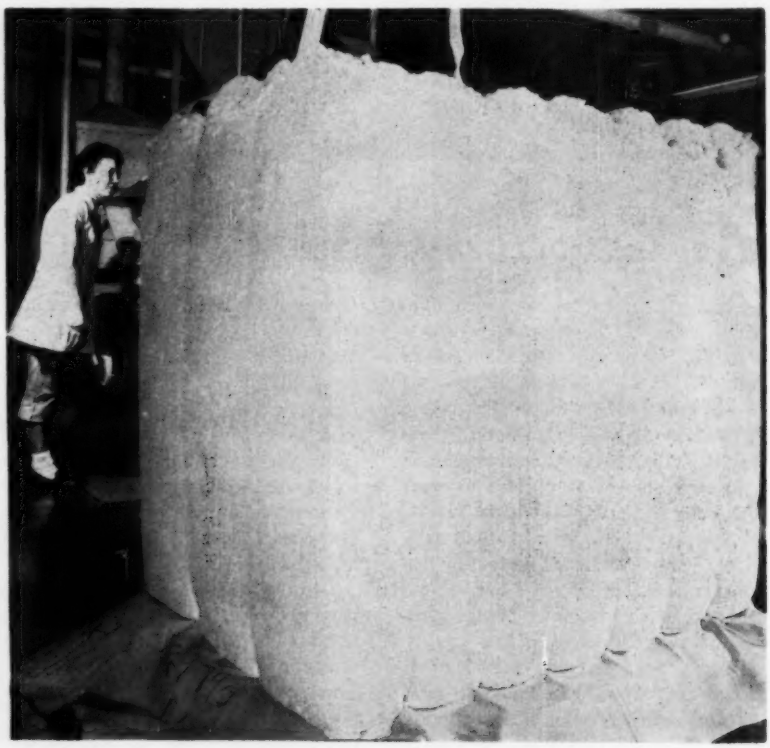
Last week, for example, besides telling of new HF facilities, Allied reported it would go into production of chlorotrifluoroethylene at Baton Rouge. The company had been producing fluorocarbon resins at its Morristown, N.J., pilot plant (*CW, Jan. 16, p. 65*).

Pennsalt Chemicals Corp., too, is getting ready to launch a new fluorine-containing thermoplastic resin (*CW, March 12, p. 32*).

And among the older fluorocarbon resin producers there are expansions. Du Pont recently commercialized its Teflon FEP resins; and last November, Minnesota Mining and Manufacturing started expansion of its Kel-F facilities.

Other outlets for HF appear to be moving less rapidly. Consumption of HF for inorganic fluorides, etching and glass work, and for special metal processes are all showing modest growth. The use of HF for making uranium fluoride has leveled off.

For the industry as a whole, however, interest in fluorine chemistry is being increased. And it appears that during the next few years, HF production will continue upward.



Final Step for Filter Cellulose

The picture above shows the final step for part of the more than 20-23,000 short tons of cellulose acetate which yearly go into cigarette filters. This 1,350-lb. block is actually a continuous ribbon (*upper left*), which peels off and feeds through several rollers, where it is flattened, before being compressed into the final filter. From this chunk alone, being processed at Brown & Williamson's tobacco plant in Louisville, Ky., about 4.8 million filters for cigarettes can be manufactured.

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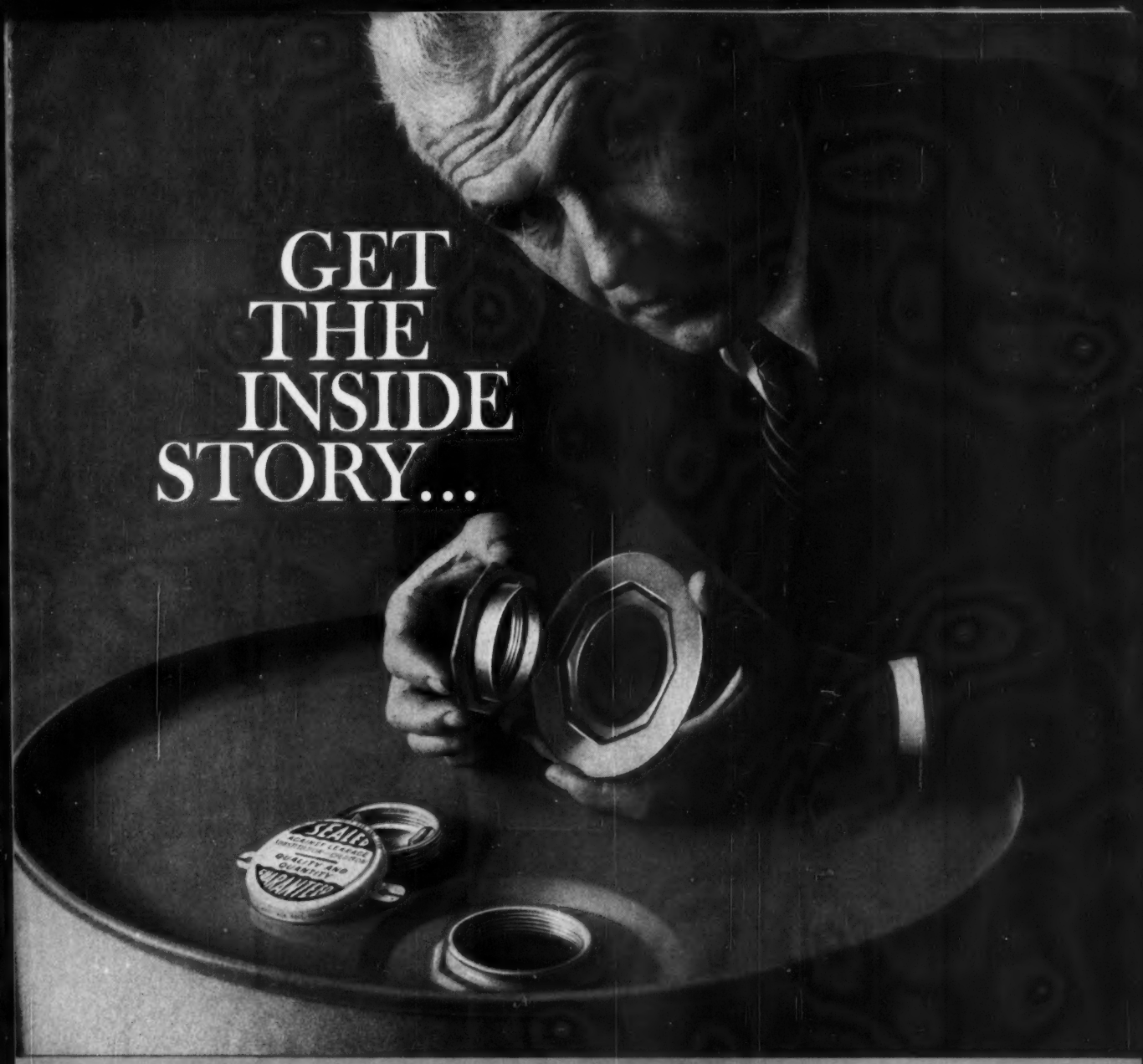

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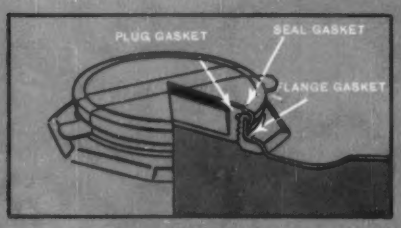

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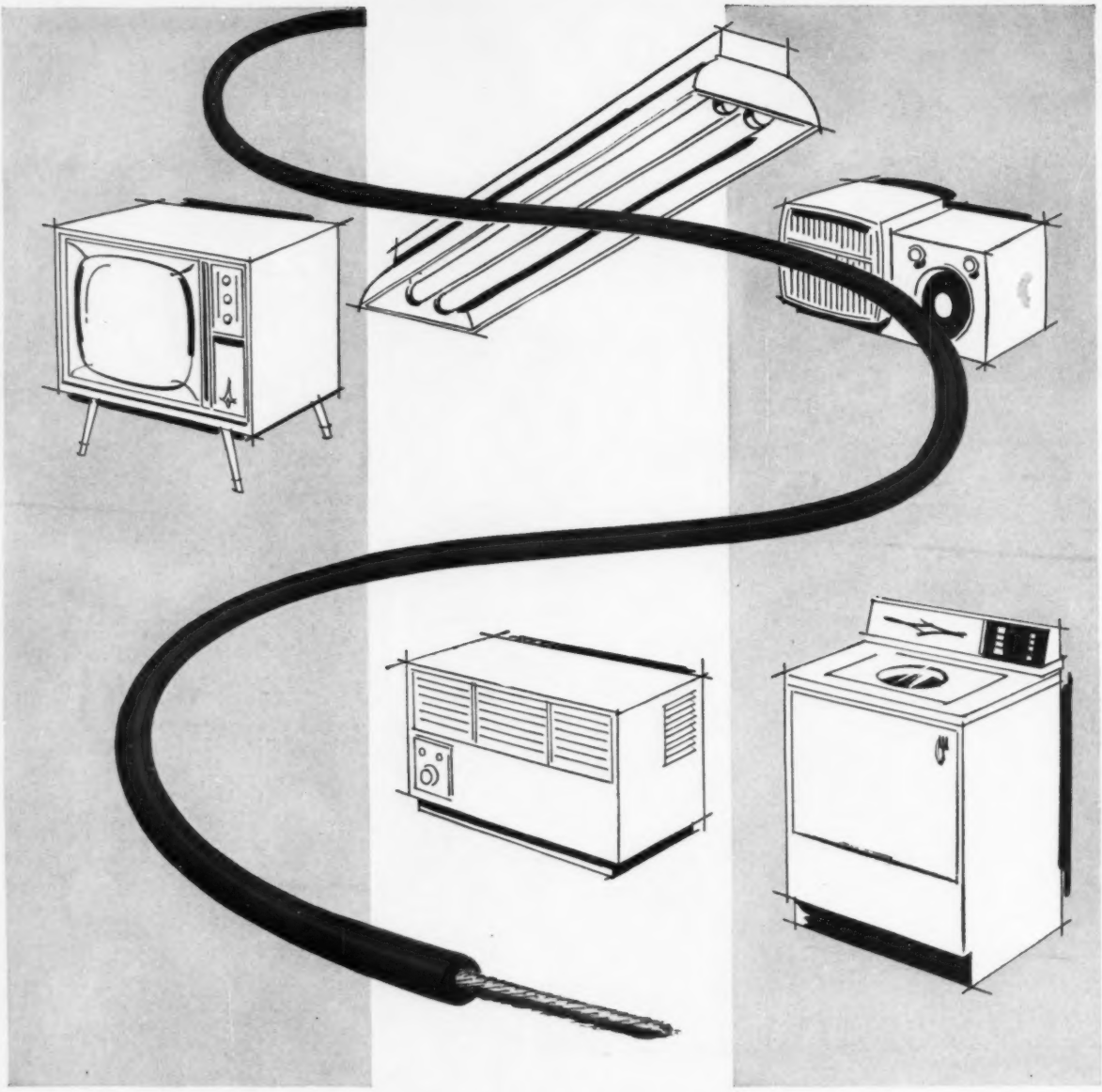

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Market Newsletter

CHEMICAL WEEK
March 26, 1960

Phthalate plasticizer price increases posted by several producers *(CW Market Newsletters, March 12, 19)* won't become unanimous throughout the industry. Kay-Fries Chemical—which rates itself among the top three producers of dimethyl and diethyl phthalate—says it won't hike prices despite moves of others. K-F will absorb higher phthalic anhydride costs, which prompted others into price-upping of derived esters.

So far, Monsanto, Allied and Reichhold have increased plasticizer price schedules. And last week Eastman Chemical joined the parade by announcing similar increases for its line of plasticizers; new Eastman tabs appear to be generally in line with those of others, with one exception—cost of diethyl phthalate remains fixed at 25¢/lb. (tank cars), whereas others are now charging 26½¢/lb.

Kay-Fries explains its reluctance to join others in price hikes: "There has been too much fiddling with prices in the past."

•

Stauffer Chemical's new alum plant at Vernon, Calif., will be onstream within 30 days. Output reportedly will range between 500-1,000 tons/month depending on demand. The new unit—Stauffer's fourth alum plant on the West Coast—will serve the southern California area.

Stauffer's expansion rides the crest of a rising demand for aluminum sulfate, which—largely created by increased needs for paper and paperboard manufacture, water and sewage treatment—has a good chance of pushing total U.S. alum production in '60 to the 1-million-tons/year mark (*CW, Dec. 5, '59, p. 85*).

•

India faces an acute shortage of chemical fertilizers, will spend several hundred thousand dollars in '60 on foreign products.

Official Indian estimates put the nation's '60 needs at about 1.88 million tons of nitrogenous fertilizers (expressed as ammonium sulfate), 342,000 tons of phosphatic fertilizers (in terms of monosuperphosphate), and 66,600 tons of potassium fertilizers (as potassium chloride).

Actual Indian production of these items: 419,300 tons of ammonium sulfate; 300,000 tons of superphosphate; 52,400 tons of potassium chloride. Demand crises in India may be eliminated, or at least eased, in the future because the nation will put up a series of fertilizer plants, starting in '61.

•

Tin export quotas were hiked again by the International Tin Council, which met in London last week. The new quota allowed to member countries is about equivalent to '57 production—which means that output restriction is virtually over. Purpose of continuing the quota system, says Tin Council chairman, George Peter, is mainly to prevent

stocks from being unloaded too suddenly on world markets—not so much to restrict production.

Tonnage allowed for the April-June quarter of '60 is 37,500 tons, compared with 36,000 in the January-March period. Also Italy will shed 2,500 tons of government-owned tin beginning in August. Hence, adequate supplies appear assured.

However, the Tin Council warns that not all of the tin may actually reach markets; one member country—Bolivia—has not reached its export quota for the current quarter.

•

A government stockpile of diamonds—amounting to almost 56,000 carats of gem-quality stones—will be sold at auction. The gems had been stashed away into the strategic materials collection for possible use as industrial diamonds at a time when supplies were running low.

First auction on April 21 will move 8,412 carats of cut and polished diamonds; some 47,049 carats of rough cuttable stones will be sold later.

•

Lithium Corp. of America has cut the price of n-butyllithium from $18.50/lb. to $12/lb. in lots of 500 lbs. or more; this tab is for 22% solutions in commercial heptane—it's also available in n-heptane at a $2.50/lb. premium. The cuts are attributed to increased production stimulated by growing use of the chemical as catalyst.

•

Calspray's nitric acid and fertilizer complex will be onstream at Kennewick, Wash., next week—April 1. Output of 150 tons/day of nitric acid will provide material for captive use—for treating phosphate rock. Another product from the fertilizer installation will be prilled ammonium nitrate.

•

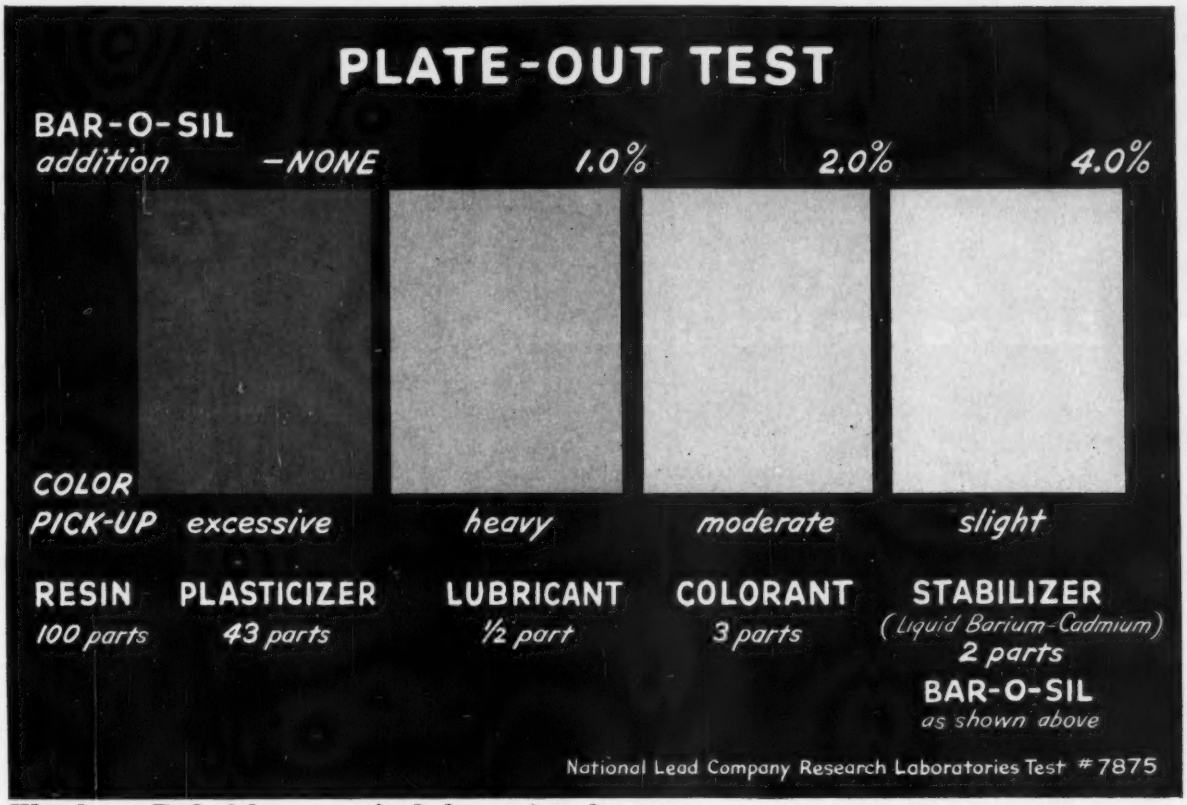
Industrial Rayon is producing polypropylene fiber and tow on a limited but commercial basis (*see also p. 37*). The fiber will be marketed under tradename Prolene, is offered in 2, 3 and 6 deniers at 90¢/lb.

•

Growing importance of export business to chemical companies is underscored by a report from Monsanto Chemicals, Ltd. (London), that the firm's '59 export sales were about 37% of its business. Total sales last year: $51.5 million; exports: $19.3 million. Behind the record sales picture: plastics operations showed "remarkable growth"; sales of heavy chemicals increased; automobile industry activity helped hike sales of rubber chemicals.

•

Spain is offering 140 tons of uranium for sale to the International Atomic Energy Agency and its member nations in 1960-62. Supplies available in '60 consist of sodium uranate—average concentration of 65% uranium—at $19.80/kilogram, f.o.b. Madrid. In '61-'62, uranium trioxide of nuclear purity will be available at $24.80/kg.



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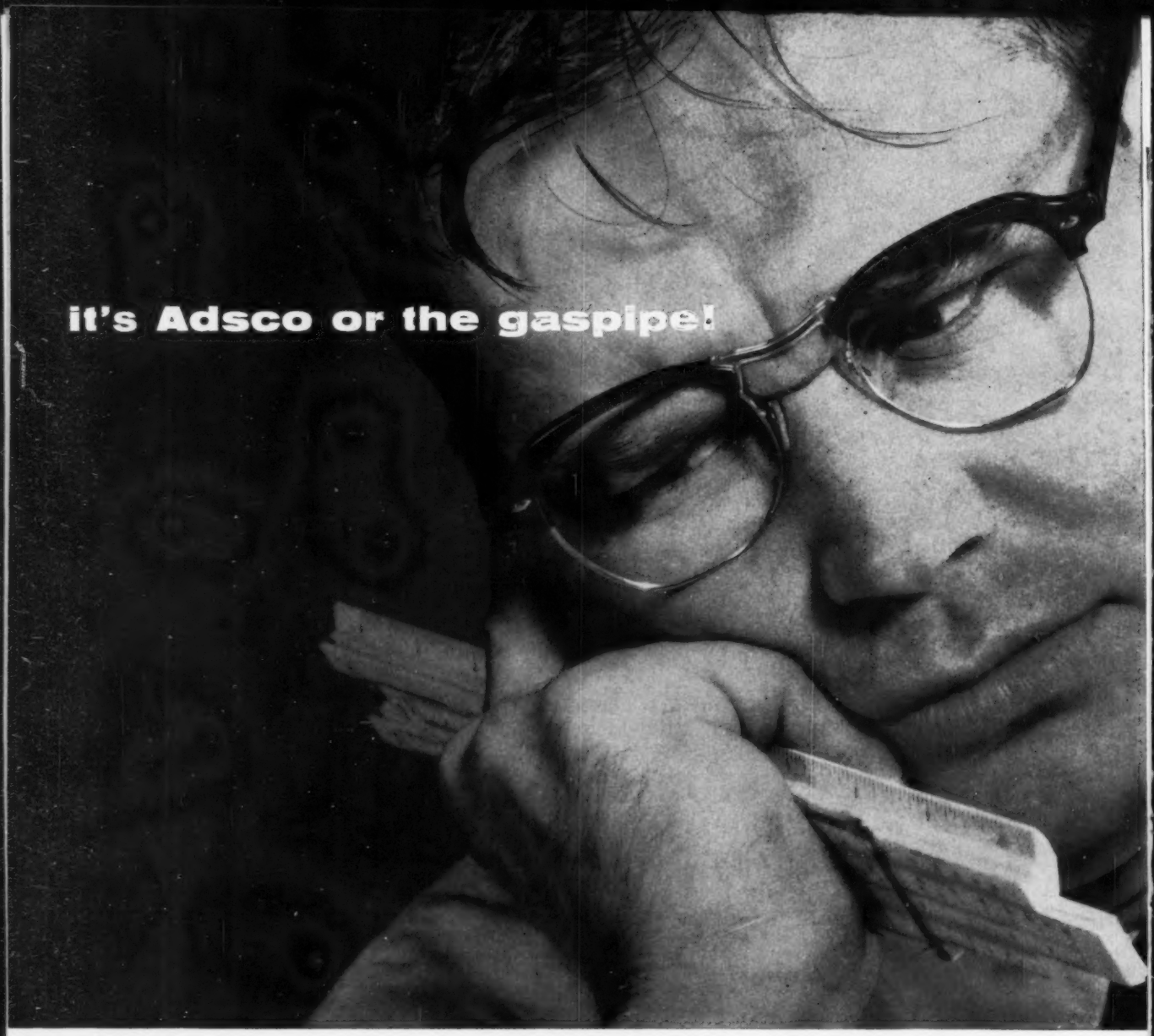

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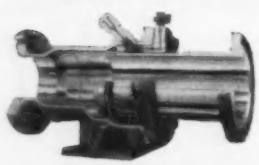

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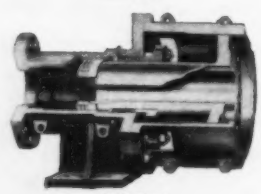

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	Reichhold	Tuscaloosa, Ala. Tacoma, Wash.	Caustic soda	
CUMENE PEROXIDATION	Hercules Oronite Shawinigan Shell Chemical	Gibbstown, N.J. Richmond, Calif. Montreal East, Ont. Houston, Tex.	Cumene	Phenol, plus acetone and acetophenone; also methylstyrene for by-product sale or recycle
TWO-STEP OXIDATION	Dow Chemical	Kalama, Wash.	Toluene	Phenol, plus benzoic acid for recycle to second stage of oxidation

Benzoic: Key to Phenol Process Economies

Dow Chemical's decision to take a two-stage oxidation route from toluene to phenol for its proposed 36-million-lbs./year plant at Kalama, Wash. (*CW Technology Newsletter, March 19, p. 73*) casts benzoic acid in a new economic role. Reason: as the key to hoped-for production economies, benzoic will have to be produced at a high-capacity rate (more than 40 million lbs./year) for less than half the going cost of commercial-grade benzoic.

Although Dow has not yet released details of its new phenol venture, the economic limits within which the process must operate are not difficult to estimate. Phenol is currently selling at 12-14¢/lb.; at 100% conversion, it takes about 1.15 lbs. of benzoic to yield 1 lb. of phenol. Top cost of the intermediate benzoic product, therefore, will obviously have to be less than 10-12¢/lb.

Production of phenol from purchased benzoic, while technically feasible, would be economically impossible. But captive production of benzoic from toluene offers several attractive, cost-cutting features. For one thing, toluene in plentiful supply, costs less than the benzene starting material used in other phenol syntheses (roughly 25¢/gal. for toluene vs. 34¢/gal. for benzene). Moreover, intermediate benzoic would not require costly storage and handling facilities, would likely not need some of the processing costs required for purification of the commercial-grade material.

The large size of the proposed plant is also expected to be an important factor in lowering benzoic costs. Dow, incidentally, is not the only company looking forward to the potential economies of large-scale processing. Heyden Newport Chemical Corp. has also disclosed plans to boost its capacity with the addition of a 12-million-lbs./year plant to produce benzoic and benzoates *(CW, March 19, p. 24)*.

Benzoic Conversion: The real key to Dow's phenol process is believed to lie in the second oxidation step, where benzoic is converted into phenol. Unlike the other routes to phenol—such as sulfonation, cumene peroxidation, and the chlorination process used by Dow's Midland plant—benzoic acid oxidation yields no by-products, thus eliminates necessity of handling and selling secondary products. The process is also expected to yield less—and easier-to-treat—waste than do the other phenol processes, which is a key factor in the pollution-conscious Pacific Northwest.

Clues to Dow's method of performing the benzoic-to-phenol conversion are contained in its U.S. patent (2,727,926). Basically, it involves a

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copper-catalyzed, liquid-phase oxidation of benzoic to yield phenyl benzoate, which is then hydrolyzed into phenol. According to the patent, benzoic acid is first liquefied by heating in a diluent or inert solvent. A catalytic quantity of cupric salt is then added and the solution is contacted with a 250% excess of oxidizing gas (air) and water or steam, while being agitated at 230-250 C. Two moles of benzoic react to form one mole of ester, plus one each of water and carbon monoxide.

Dow's investigation also covered the use of promoters—salts, oxides or hydroxides of metals other than copper—to boost yields. Results indicated that conversion is improved by the addition of promoters in amounts up to 0.17 mole/mole of acid. Preferred promoters: compounds of magnesium or cobalt. Lab work also indicated that the process could be varied to operate over a wide temperature range by altering the pressure and the reaction medium.

In the final hydrolysis, phenyl benzoate is split to yield one mole of phenol, plus one of benzoic acid. This is recycled to the process. Because the oxidation of benzoic may also produce some breakdown products, it's believed that intermediate purification may be done after the ester has been formed.

License Pact: In addition to the process developments worked out at Dow's benzene products laboratory in Midland and labs at Pittsburg, Calif., the Kalama plant will include know-how licensed from California Research Corp. CRC also has a patent (U.S. 2,766,294) on the copper-catalyzed oxidation of benzoic, a process it developed independently at about the same time Dow's process was being worked out. (CRC's process is quite similar to Dow's, except that it doesn't include catalyst promoters.) CRC's toluene route to phenol is believed to be one of the alternates considered by Oronite before it elected to license Hercules' cumene process for its Richmond, Calif., plant.

Neither Dow nor CRC has disclosed details of the licensing agreement. But despite the overlapping patent interests in the final oxidation step, it's likely that Dow may be counting on CRC processing know-how to lend a hand in the vital first step from toluene to benzoic.

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Room for Art?

Does aesthetics have a place in plant design? Until now, this intriguing question has been paid scant attention by calculations-conscious design engineers in the chemical process industries. But at least one veteran engineering-manager is now willing to answer the question positively. He says that aesthetics is not only desirable—it's essential for successful plant design.

W. W. Kraft, vice-president of the Lummus Co. (New York), will spell out his views on this little-discussed subject next week at a seminar for the faculty and graduate students at the University of California (Berkeley).

Kraft, who has 30 years' experience in chemical process plant design, defines aesthetics of equipment items, or their combinations, as the artistic or geometric attractiveness of their appearance. He's convinced that seasoned engineers demonstrate, perhaps even subconsciously, an aesthetic approach to plant design.

For example, Kraft believes that an engineer's yen to work with design models is one indication of this trait. On this score, he believes that design engineers in many companies are often hard-pressed to justify the use of models in terms of drafting-room man-hours saved. One explanation often offered: it's not the number of drawings you save on, it's the number of drawing revisions you avoid later.

Kraft feels that the same thinking carries through on the aesthetics-vs.-calculations debate. Declares Kraft: although design calculations are certainly necessary in plant design, an experienced eye—working according to aesthetic principles—can discover errors in calculations or point out potential trouble spots that require additional calculations.

To illustrate his views, Kraft cites several areas where design calculations should be subordinated to the aesthetic sense of the experienced engineer:

• In a fired tubestill heater, which is used to heat crude oil feedstock to temperatures of about 750 F, as heat input increases, the lighter components in the crude are vaporized. This causes the volume to expand, and the oil must be divided from one stream into two, four, even eight, parallel streams as it passes through the furnace. All these streams must then be recombined at the outlet.

If the piping is not designed in aesthetically symmetrical patterns, the result will be unbalanced flow resulting in overheating, undesirable cracking, and coke formation on the tube walls. And if the pipebends and connections are not streamlined, they will rupture under the stress of thermal expansion.

Although the limits of diameter and allowable stress must be determined by calculations, says Kraft, the streamlined and symmetrical piping layout, as well as the points of critical stress, can more readily be determined visually.

• In a fluidized-bed system, such as is used with catalytic crackers, finely divided solids are carried in pipelines and supported in vessels by streams of gases. Although calculations can determine the required diameters of pipe and vessels, only an experienced eye can establish the symmetry of arrangement needed to avoid gas channeling, surging, backflow, eddy currents, and similar phenomena.

Although calculations must be used to determine thermal and pressure stresses, wall thicknesses, and the supports required, streamlining diminishes these stresses, and an experienced engineer can see these critical points.

• Slurries cause special difficulties, which can be avoided by streamlining, with symmetrical arrangements worked out according to an aesthetic sense. For example, proper design avoids piping and equipment arrangements that cause still areas or eddy currents adjacent to the main flowing stream.

• Condensing systems, where large volumes of vapor are cooled and simultaneously condensed with a corresponding reduction in volume, are perhaps the most common and most important systems requiring an aesthetic approach to design. Multiple units of shell and tube heat exchangers are employed here; and the flow must be balanced between the units. Each unit must also be arranged internally so that flow around the tubes is symmetrical. In this instance, unbalanced flow causes unbalanced condensing rates, hot spots, subcooling, and bypassing of valuable condensable products.

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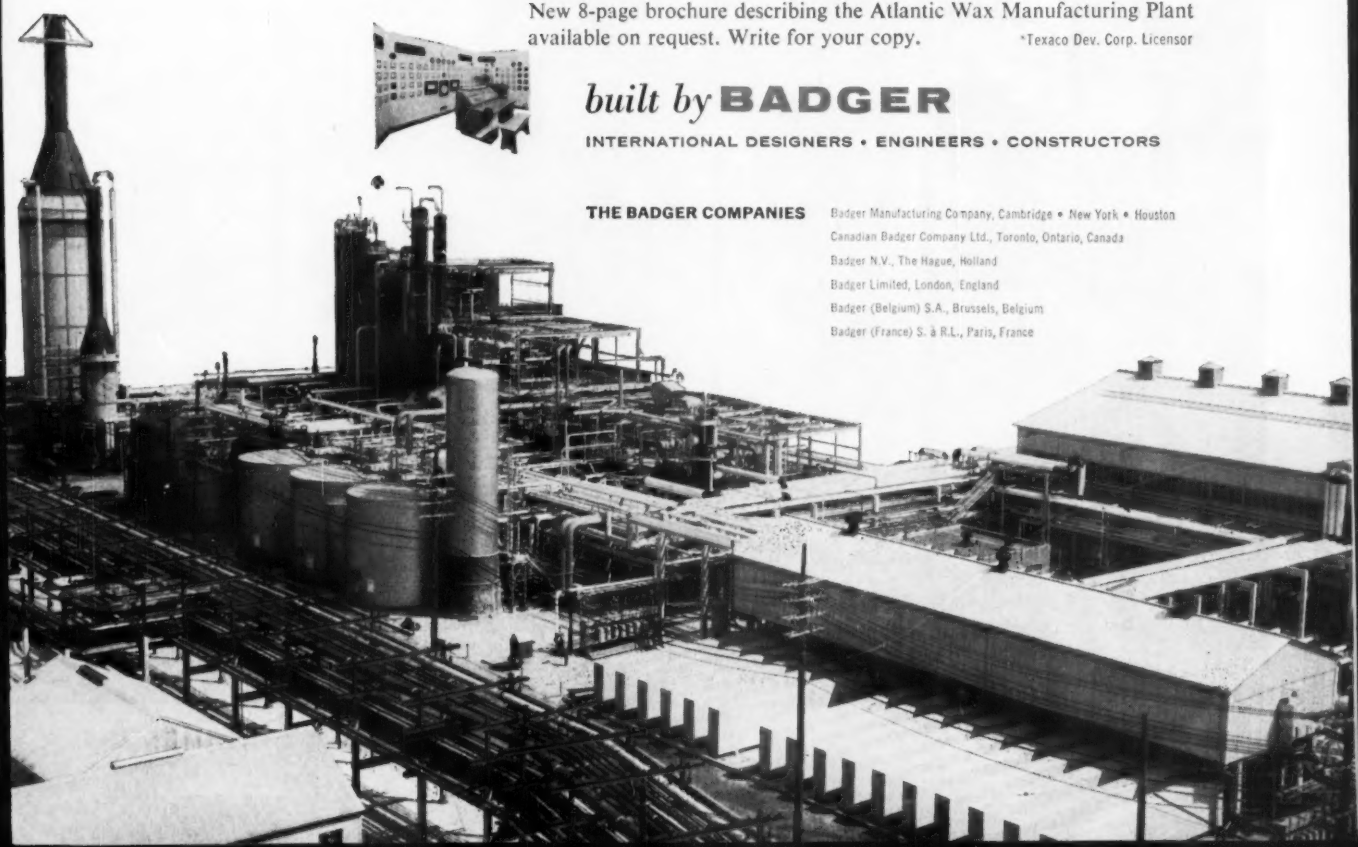

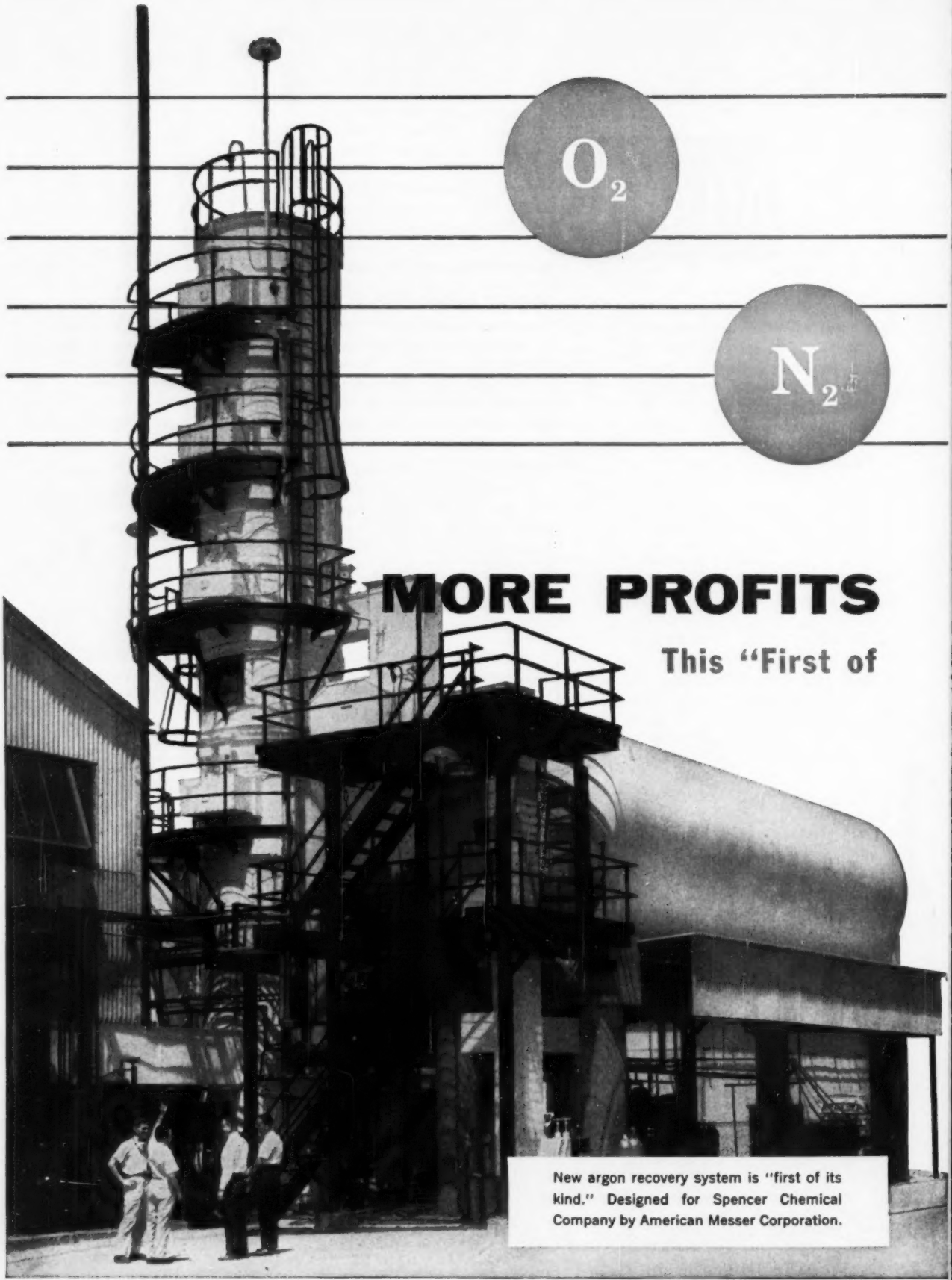

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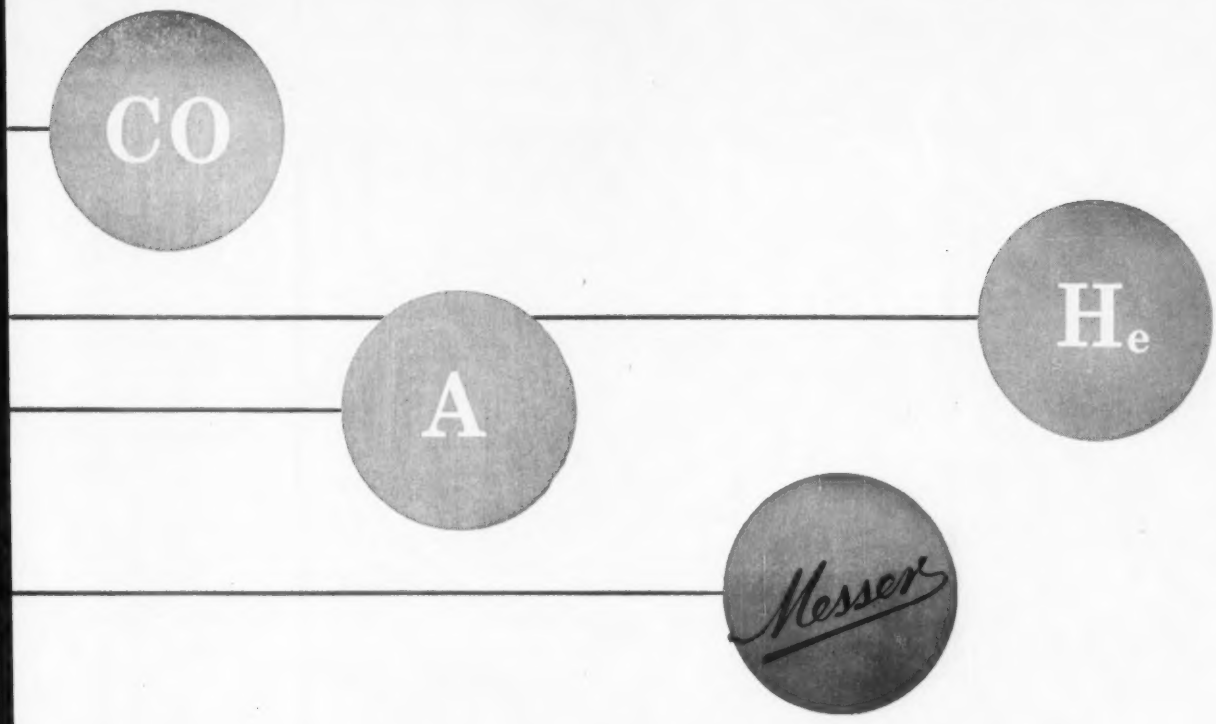

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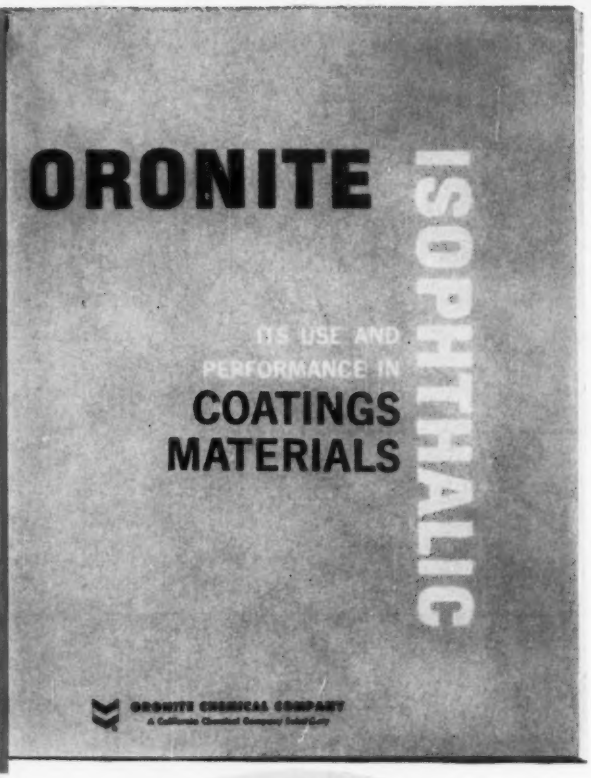

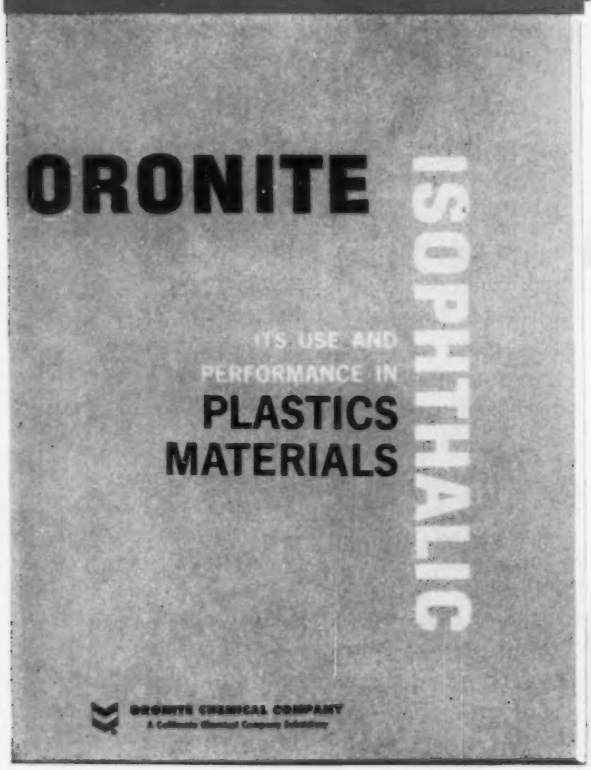

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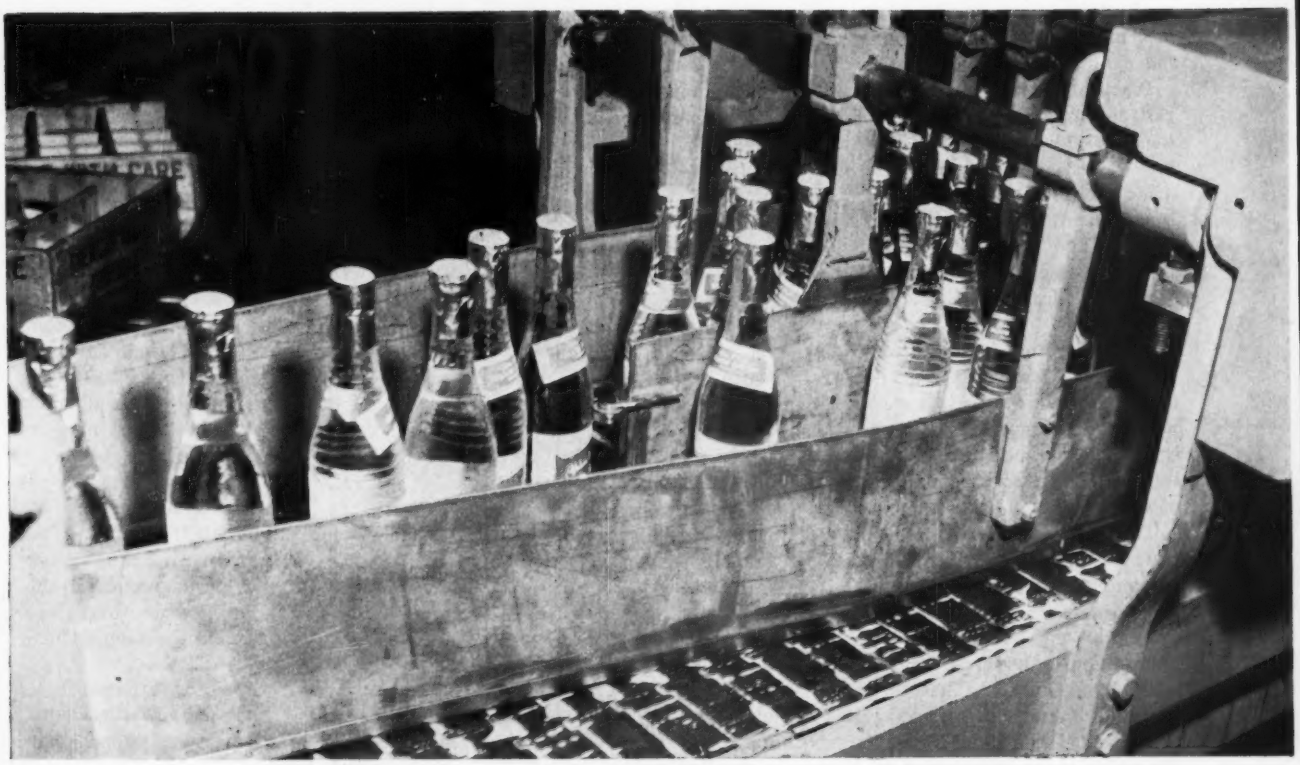

Over 4,500 bottlers of carbonated beverages rely on specialties companies for ingredients, cleaners.

Soda Pop Puts Sparkle in Specialties Sales

This week the average U.S. consumer will drink four bottles of soda pop. By the end of the year, he will have put away 203 bottles of the fizzy beverages. These statistics* cheer not only soda makers and bottlers but also the chemical industry, which supplies a multitude of ingredients and detergents to the carbonated beverages business.

Chemicals for the $1.5-billion soft drink industry fall mainly into two categories: raw materials — e.g., flavors, food colorings, carbon dioxide, cyclamates, acidulants, ascorbic acid, benzoic acid and emulsifying agents — and maintenance chemicals for bottle washing and plant cleaning, such as caustic soda, gluconic acid, phosphates, silicates, surfactants and sanitizing agents.

Other chemical products are used in packaging — e.g., propylene glycol for plasticizers in corks, inks for cardboard cartons and bottle labels, resins for can linings.

These materials add up to a hefty market for chemical makers.

Old and Still Growing: The steadily booming soft-drink business plans to sell about 1.7 billion gal. of its products this year — close to 1.5 billion cases. The industry is far from an infant. In fact, natural carbonated water from bubbling springs were popular in the 16th century. Joseph Priestley, English discoverer of oxygen, is credited with developing artificially carbonated water. Commercial carbonated beverages first came into use in Philadelphia in the early 19th century, when a few druggists added flavor to carbonated water. They became the first bottlers.

Today there are 4,519 bottlers of soda pop in the U.S., including both franchised bottlers and independent companies, plus private-label-brand bottlers — mostly supermarket chains (with their own bottling operations) and the vending-machine companies.

Many bottlers hold franchises from more than one soft-drink company, bottle their own brands as well for local consumption.

Ingredient Chemicals

The soda pop makers are the biggest consumers of flavors in the U.S. Charles P. Walker, president of International Flavors and Fragrances Inc. (New York), estimates that some $75 million/year are used.

Most popular flavor is still the cola-type drink (65-70% of all pop sold); lemon-lime, ginger ale and mixer beverages are next; orange flavors are third, and then root beer. Definitely in the minority are so-called red flavors like cherry, raspberry, grape, and strawberry, and off-beat items like quinine water, celery tonic, etc.

About 80% of the flavors used are

* The average consumer drinks more and more soda pop each year—in '29, he sipped 53 bottles; 133 in '45; 184 in '55.

natural, and this trend seems to be continuing. Generally, natural flavors are more expensive than the synthetic, and moreover, greater quantities of the natural must be used.

Practically every flavor house supplies the soft drink industry. Some of the specialty companies in this field are Florasynth Laboratories; Syntomatic Corp.; Rhodia, Inc.; Magnus, Mabee and Reynard; International Flavors and Fragrances; Fritzsche Brothers (which owns the flavor house Dodge & Olcott). All are in New York.

Recipe for Pop: A typical soft drink recipe goes somewhat like this—2 oz. of flavor are added to each gallon of sugar syrup. Next comes water, carbon dioxide, citric acid, color, and sometimes a preservative like benzoate of soda. Result: 6 gal. of pop.

The quantity of flavor will vary, however, from ½ oz. to 4 oz., depending on the flavor.

Colors: Of the 15 food colors approved by the Food and Drug Administration, only seven are used by the soda pop makers. The others are either too insoluble or fade too easily. Sold in dry, paste and liquid form, the colors must be certified by the government. For example, ½ to 2 oz. of powdered color is added to each gallon of flavor. In many cases, the colors — also supplied by the flavor houses — are added to the flavor formulation before shipment. Some of the larger bottlers, though, buy colors and add them themselves.

Not all soda drinks contain color, e.g., a pale ginger ale. But usually natural fruit flavors like orange, cherry, etc. have too little color to appeal to the consumer.

New Flavors: Soda makers are continually considering new flavors, and many flavor houses are in the process of developing new ones. Despite this fact, the number of flavors on the market seems to remain about constant. The problem here is that marketing a new flavor requires tremendous outlays for promotion, and even then the public may not buy. Some flavors inexplicably sell better in one section of the country than another.

Some of the biggest pop makers, whose traditional product has been a cola flavor, are branching out into other, but not necessarily new, flavors. For the past year Pepsi-Cola (New York) has been test-marketing Teem, a lemon-lime drink, in about 50 areas.

Coca-Cola (Atlanta) has been selling its Fanta in the U.S. for two years (before that sales were strictly overseas). Flavors include orange, lemon-lime, grape, root beer, and ginger ale.

Sweeteners: In addition to the 1.7-million tons of refined sugar that pop makers will use this year, the growth of sales in general and of dietetic drinks in particular has proved a great boon for suppliers of artificial sweeteners.

One of the biggest producers of low-calorie pop is Kirsch's Beverages, Inc. (Brooklyn), with its No-Cal, which first appeared in 1952. Among others are Cott Beverage Corp. (New Haven, Conn.), Hoffman, Inc. (Newark), Canada Dry (New York); many independent bottlers carry a line of dietetic drinks. Sales are heavily concentrated in large metropolitan areas and biggest consumers are women.

In '59, 18 million cases of sugar-free beverages were sold.

Largest suppliers of the calcium and sodium cyclamates going into these beverages are Abbott Laboratories (Chicago), Du Pont Co. (Wilmington), Chas. Pfizer & Co., Inc. (Brooklyn) and Merck & Co., Inc. (Rahway, N.J.).

A relatively new product using artificial sweeteners is the carbonated tablet that is dropped into a glass of water. Fizzies Division of Warner-Lambert (Baltimore), has been marketing its Fizzies tablet for three years.

More Raw Materials: A bottle of soda pop holds many more chemicals. The tang in these beverages is supplied by tartaric and citric acid. About 10 million pounds of acidulants are used each year.

Some drinks now contain ascorbic acid (Vitamin C), which acts as an antioxidant and a vitamin supplement. It is said that the ascorbic acid improves flavor's shelf-life stability.

Most fruit beverages use benzoate of soda as a preservative. Emulsifying agents are frequently used in orange pop to give the product its cloudy appearance.

Quantities of the all-important carbonic gas — both liquid and solid— come to 250 million lbs./year.

Detergents for Bottling

Sanitation is extremely important in the bottling of soft drinks and, since soda drinks are considered a food by the U.S. Dept. of Agriculture, most states have laid down requirements for washing bottles.

The American Bottlers of Carbonated Beverages (Washington, D.C.), which represents the industry, recommends that bottles pass through a soaking and washing machine where they are soaked for not less than 5 minutes in a 3% alkaline solution at 130 F.

The most commonly used alkali for this process is caustic soda. One of the major soft drink companies alone buys 1 million lbs./-year of caustic for bottle washing in its 12 plants. About $10 million of caustic and other detergents are bought each year for this purpose.

The trend now is to mixing an additive with caustic to prevent lime buildup and hazy bottles. Chas. Pfizer is one company that is selling sodium gluconate and gluconic acid for this market. Oakite Products, Inc. (New York) sells a liquid chelating additive called Oakite C.A.L.

Other more expensive formulations contain silicates, anionic surfactants, soluble inorganic alkalis, and phosphates.

More detergents are required to clean syrup tanks, soakers, walls, floors, filling machines, etc., and frequently a germicide is used. Dozens of chemical companies supply the needs for bottle washers.

Whom to Sell: The chemical supplier must sell his wares on a number of levels in the soft drink business. Flavor makers and most other suppliers of ingredients do business with three groups. Most large pop companies select suppliers for their franchised bottlers. The independent bottlers, of course, deal directly with the flavor houses. Finally, the raw-materials maker can sell his products to a middleman who repackages the materials and sells to small bottlers.

Companies supplying additives for bottle-washing compounds deal with the custom formulators, and they, in turn, usually sell directly to the bottlers. Repackagers also operate in this area.

A competitive price is generally important in the case of caustic and flavors (there's a wide range in flavor prices). Acidulant prices vary little.

FDA Problems: For the most part the soft drink industry has not yet

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St. Louis 8.....R. J. Claussen, 3615 Olive St., Continental Bldg., JEfferson 5-4867

*For complete product data see catalog unit in the BUYERS' GUIDE ISSUE for 1959-60

been much affected by the Food Additives Amendment. Two flavor casualties should be noted, though.

Coumarin, an ingredient in cream soda, already has been banned; and the root beer makers face trouble with their use of safrol. It's likely they'll have to find a substitute.

Packaging Materials

It now appears that most of the significant developments in the soft drink industry will be in packaging rather than in ingredients. Chemical companies come into the picture here, too, in supplying materials for new packages.

Pop in cans made a big splash in '54, and this trend will probably grow.

The technical problems with cans, mainly in developing a proper lining, have been licked. Continental Can Co. (New York) is employing as a liner an epoxy basecoat with a vinyl topcoat.

Still to come is a plastic package. The difficult goal: a container that will take the pressure of carbonation and that can be competitively priced. One major company is known to be working on a plastic container; its form may be a bag, box, or bottle. Some experts in the field are betting on the bag. (Paper cartons, similar to milk cartons, have also been proposed but pressure difficulties have not been solved.)

Other uses of plastic now being mentioned: plastic cases to replace the 24-bottle wood crate, and plastic for the six-bottle cartons.

A final peek into the future is provided by Bradford McFadden, publisher of the *American Soft Drink Journal* (Atlanta). An innovation which housewives will soon be able to pick up in their supermarkets is the home "casette," a small premix tank which is filled by the bottler. The consumer leaves a deposit on the container, can store it in the refrigerator and push a button when she wants a fountain drink. A second development described by McFadden is a coin-operated machine that will dispense cartons rather than single bottles. Pepsi will test this idea in May in Chicago.

As the soft drink business moves along toward increasing sales and bigger profits based on ideas like these, chemical suppliers will also find new sparkle in their own sales.

Tracers

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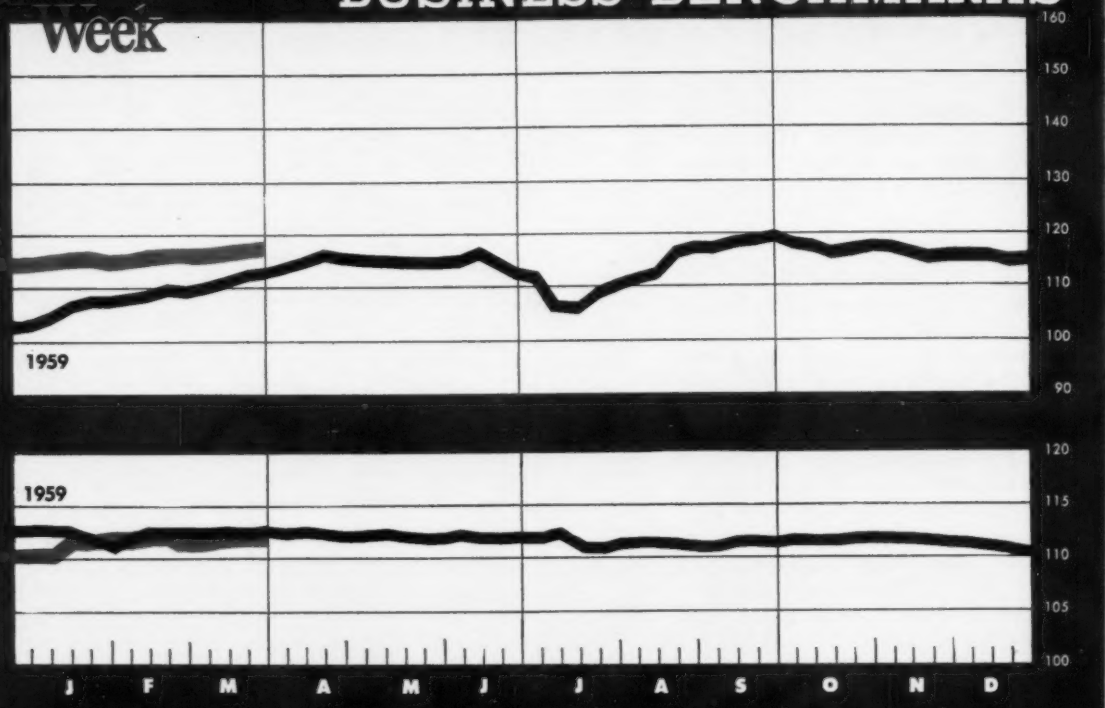

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WEEKLY BUSINESS INDICATORS	*Latest Week*	*Preceding Week*	*Year Ago*
Chemical Week output index (1947-1949=100)	118.0	117.8	113.7
Chemical Week wholesale price index (1947=100)	110.8	111.4	112.1
Stock price index (12 firms, Standard & Poor's)	53.31	52.26	53.55
Steel ingot output (thousand tons)	2,597	2,654	2,631
Electric power (million kilowatt-hours)	14,271	14,262	12,996
Crude oil and condensate (daily av., thousand bbls.)	7,049	7,153	7,155

EMPLOYMENT INDICATORS (thousands)	*Latest Month*	*Preceding Month*	*Year Ago*
All manufacturing	16,504	16,438	15,768
Nondurable goods	6,867	6,891	6,764
Chemicals and allied products	857	859	820
Paper and allied products	558	561	552
Rubber products	266	266	257
Petroleum and coal products	232	233	236

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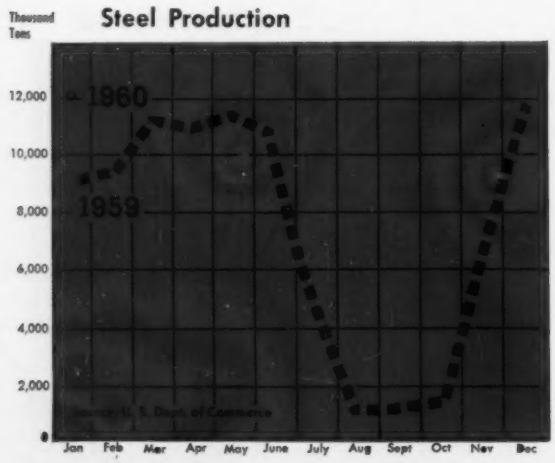

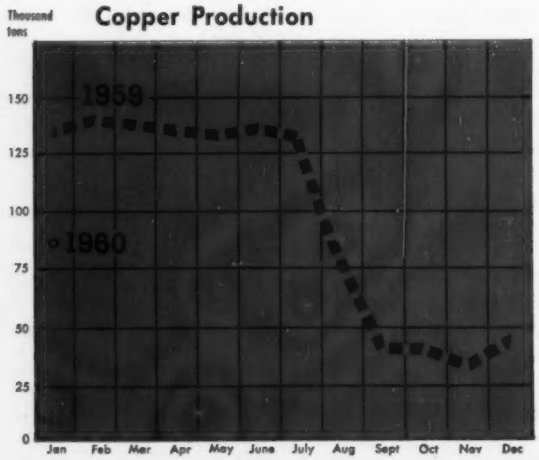

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Technical data available:

( ) General Properties, Functions and Uses (#cgen-1)
( ) Cab-o-sil in the Rubber Industry (#crub-1)
( ) Cab-o-sil in Butyl Rubber (#crub-2)
( ) Cab-o-sil in Dipped Latex Films (#crub-3)
( ) Cab-o-sil in the Lubricating Grease Industry (#cgre-2)
( ) Aqueous Dispersions of Cab-o-sil (#cmis-2)
( ) A Flatting Agent for Varnishes (#cpai-3)
( ) Cab-o-sil in the Reproduction Paper Industry (#cpap-1)
( ) Cab-o-sil in the Plastics Industry (#cpla-2)
( ) Cab-o-sil in Automobile Polishes (#cpol-1)
( ) Cab-o-sil in Pharmaceuticals and Cosmetics (#cpha-1)

White carton makes a beautiful picture

The natural color and texture of luscious fruit contrast strikingly with the bright white background of corrugated kraft. So do product, company identification, and brand name when carried as part of this "new look."

That's why the shipping carton is becoming more than just a container to carry the goods to market. In sparkling white, it attracts attention in shipment—and at the end of the line where sales are made.

It takes proper increase of TITANOX® white titanium dioxide pigment in coatings and liners to obliterate drabness and truly present the new look that affords sharp contrast for merchandising messages.

To help you gain the full benefits of white pigmentation is our most important job. And this applies not only to paper, but anything that needs white pigment . . . inks, paint, rubber, plastics, leather, ceramics and building materials, to name some. Titanium Pigment Corporation, 111 Broadway, New York 6, N. Y.; offices and warehouses in principal cities. In Canada: Canadian Titanium Pigments Ltd., Montreal.

TITANIUM PIGMENT CORPORATION

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